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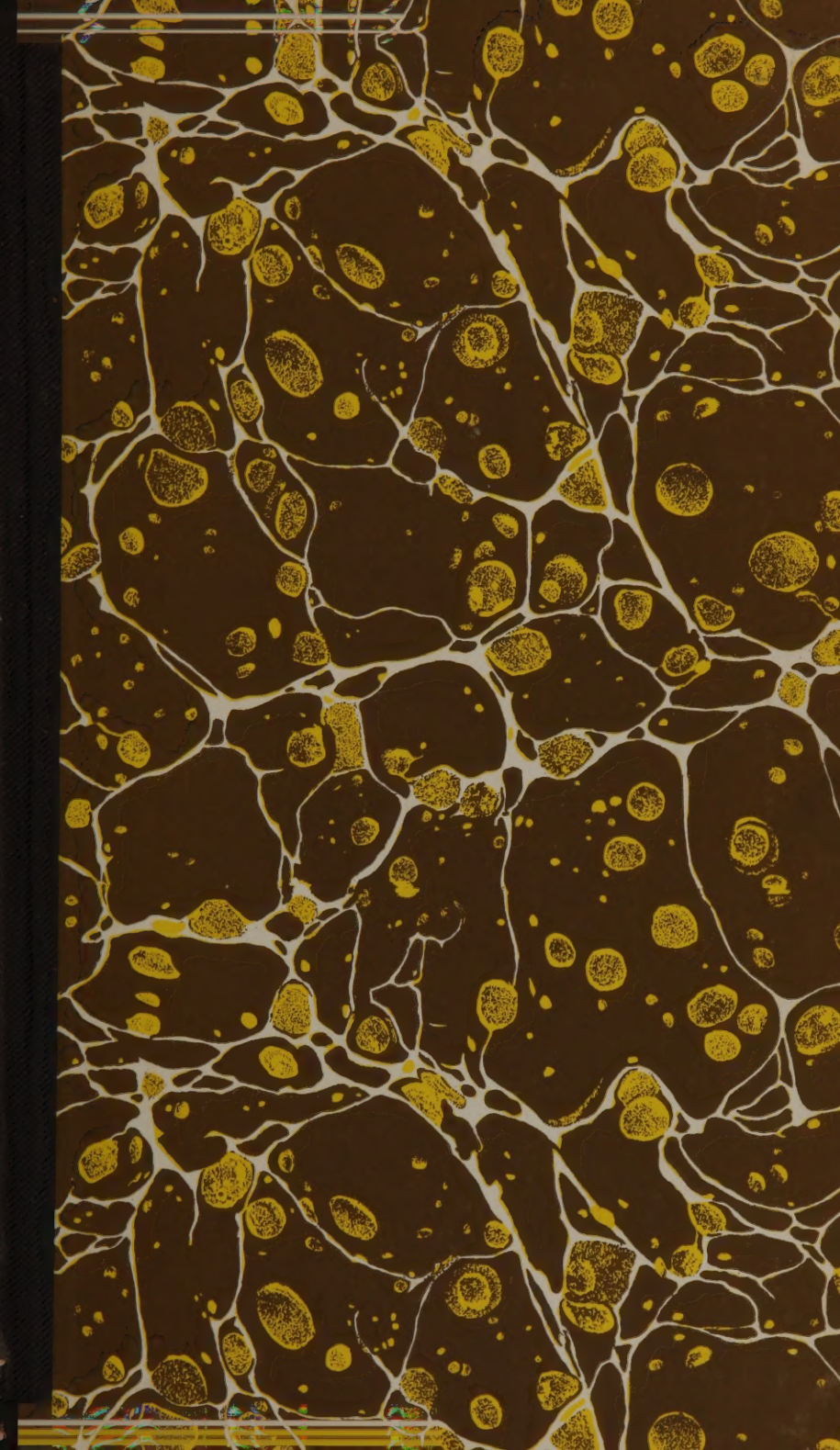
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INSTITUTES

AND

PRACTICE OF SURGERY:

BEING

OUTLINES OF A COURSE OF LECTURES,

BY

WILLIAM GIBSON, M.D.,

PROFESSOR OF SURGERY IN THE UNIVERSITY OF PENNSYLVANIA, ETC., ETC., ETC.

Segnius irritant animos demissa per aurem,
Quam quæ sunt oculis subjecta fidelibus.—HOR.

EIGHTH EDITION, IMPROVED AND ALTERED.

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IN TWO VOLUMES.

VOL. I.

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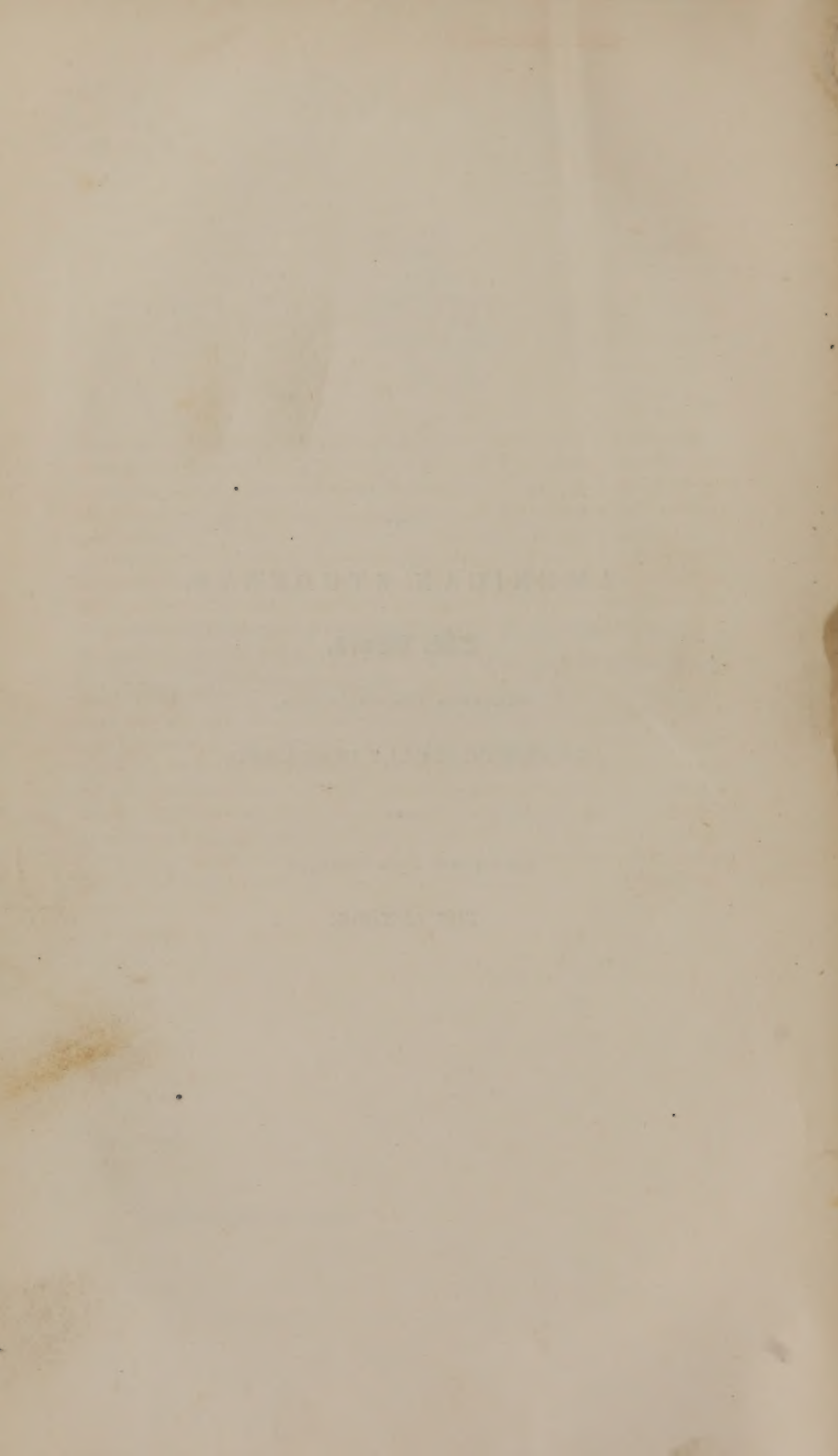
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TO
AMERICAN STUDENTS,
This Work,

COMPOSED FOR THEIR USE,
IS RESPECTFULLY INSCRIBED,

BY
THEIR FRIEND AND COUNTRYMAN,

THE AUTHOR.



PREFACE.

As expressed in the title, this work must be considered a mere *outline* of the Lectures, which will be filled up by numerous illustrations, derived chiefly from an extensive collection of models, morbid preparations, *magnified* drawings, and *imitations* of disease on the dead subject. The last two modes of instruction I consider peculiarly my own. Be this as it may, I have long been convinced of the importance, in addition to description, of exhibiting as much as possible to the *eye*—being well aware that what is merely told is soon effaced from the memory, whilst an impression received through the sight is comparatively indelible. Upon this principle, my system of teaching is chiefly founded, and to a proper comprehension of it the present work will, I believe, greatly contribute.

Having enjoyed, during three visits abroad, ample opportunities of collecting the best ancient and modern surgical writings, I have seldom ventured to cite or recommend a publication, without having minutely examined its contents. The reference, therefore, given at the end of almost every section, may be relied upon, as containing the most precise and accurate information on the various topics embraced within the work. This, to the student, I hope, will prove valuable, especially as great care has been taken to exclude from the reference every publication of equivocal merit.

The work has been pronounced by hypercritics “a book on the practice of medicine.” A greater compliment could not have been paid to it; yet it argues very narrow views on the part of those who strive to affix limits to sciences which “blend, soften, and unite” in every possible way. True, it has been customary, in Europe, for the sake of professional convenience and subdivision of labour, to separate the practice of surgery from that of medicine; but the result has never proved satisfactory to practitioners, and rarely, if ever, to patients. In some countries the mass of business is in the hands of surgeons and apothecaries, who prescribe for all common complaints, while the mere physician is consulted in extraordinary cases, and is content with his “otium cum dignitate.” In this country, on the contrary, the physician is invested with the management of all common medical and surgical cases, and, in general, is willing enough, where the cases are simple, and the responsibility inconsiderable, to officiate to any extent—but equally prompt to avoid the more difficult cases, or such as require delicate or important operations. By individuals, thus situated, attempts have been made to confine the duties of the surgeon to intricate and capital operations, and reserve for themselves the whole practice of physic and medical surgery. Fortunately, however, such projects have hitherto failed, and the good sense of the community has established the point that a good surgeon must be of necessity a good

physician (though a good physician need not always be a good operator), and that a mere "*cutter*" is the most humble of all professional creatures.

The *style* of this work has been objected to—as not sufficiently diffuse; but, on the contrary, condensed beyond reasonable conciseness. That I have studied to retrench superfluities, both in expression and matter, I freely acknowledge, and so far plead guilty to the charge. Amplification, however, has not been considered, I believe, either by ancient or modern scholars, as peculiarly adapted to works of science, and I only fear that if subjected to rigid scrutiny by such critics, I should be condemned upon the score of diffusiveness; for "to say much in a few words is certainly a great difficulty in composition." *Medio tutissimus ibis* would, perhaps, be a safe motto for most medical writers; for without imitating the prolixity of Cicero, or the brevity of Sallust, or of the ancient king, who said to his soldiers on the eve of battle, "I am your general—you are Frenchmen—there are the enemy," it should be sufficient to avoid, on the one hand, all lengthened periods, and on the other, the simple affirmative or negative of the "plain-dealing, truth-loving quaker."

In spite of determined opposition and the introduction into this country of European books on Surgery, translated or edited by American teachers, these *outlines* have reached the EIGHTH edition. This affords full evidence of the value of the plan in public estimation, and would seem to supersede the necessity of materially increasing the bulk of the volumes, at the cost of the purchaser, especially as all matters of novelty and real importance are freely introduced into, and fully discussed in the lectures. One subject, however, omitted accidentally in the text, I cannot avoid referring to in this place,—certain diseases of the bones and joints, particularly noticed by Dr. Robert Smith of Dublin, in a very interesting and valuable volume published a year or two ago; for the knowledge of which, I feel under great obligations to my intelligent and accomplished friend, Dr. Green, of the United States Navy. Fortunately, amongst the immense collection of diseased and injured bones contained in my cabinet, there are numerous splendid specimens of every variety of affection described in that volume, and these will be presented to the class and fully explained.

Philadelphia, October, 1849.

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THE INSTITUTES

AND

PRACTICE OF SURGERY.

CHAPTER I.

INFLAMMATION.

THE words *inflammatio*, *phlegmon*, and *phlogosis*, have been employed indiscriminately to denote that disease, in which there is unusual redness, heat, swelling and pain.

By most writers, inflammation has been divided into acute, chronic, healthy and unhealthy; though not, perhaps, with much propriety. Two distinct stages of the disease have also been pointed out. In the first stage there is coldness, languor, nausea, pain in the head, a small quick pulse, and a parched tongue. In the second stage, the skin is hot, the pulse full and hard, the thirst considerable, and the part affected becomes swelled and painful. Every inflammation, however, is not accompanied by constitutional symptoms.

There are eight *terminations* of inflammation—resolution, adhesion, effusion, suppuration, ulceration, granulation, cicatrization, and mortification. These terminations constitute a series of stages, extremely interesting to the surgeon.

The *heat* of inflamed parts is *apparently* very considerable; but it was satisfactorily ascertained by Mr. Hunter, that it never rises above the natural heat of the animal, or that at the source of circulation. An increase of heat, both in healthy and in inflamed parts, probably depends chiefly upon an increased velocity in the circulation of the blood. The heat generally continues so long as the part remains dry, and is speedily diminished upon the appearance of perspiration.

In most inflammations the *redness* is diffused among the surrounding parts, but in inflammation of a *specific* kind, it often stops with an abrupt edge. The redness, in some instances, has a dark hue, in others a bright scarlet. An increase of redness must always depend upon an inordinate determination of blood to the vessels of the part. The red capillaries are first enlarged, and the blood is thence, oftentimes, transmitted to the serous vessels. These changes have been happily illustrated by some very interesting experiments of Mr. Hunter.

The *swelling* is for the most part confined to the cellular texture, and is commonly greatest where the inflammation commences. At first it is owing to an inordinate quantity of blood determined to the part; its continuance, however, must depend either upon an effusion of serum, or upon an exudation of coagulable lymph into the cellular texture.

The *pain* is acute or otherwise, according to the texture of the part affected. Some organs in their natural state are, comparatively, insensible, but when inflamed exquisitely painful. In some inflammations, instead of pain, there is a pruritus or itching. In others, the pain is pulsatile. Again, in particular species of inflammation, a burning sensation is produced. The pain, in every instance, perhaps, depends upon the nerves of the part being compressed by the surrounding swelling.

The *causes* of inflammation may act either chemically or mechanically. Among the former, *cold* is supposed to exert a greater power than any other agent. Its first effect is to debilitate the extreme vessels, and to diminish the sensibility of the part to which it is applied. Cold may operate directly or indirectly. In the former case, the part may be irrecoverably destroyed, provided the temperature be sufficiently reduced; in the latter, various degrees of inflammation may arise. How the *indirect* application of cold is productive of inflammation is a question which has never been satisfactorily solved. Cold, when combined with *moisture*, more readily excites inflammation than when deprived of it.

Heat may also be said to produce inflammation by its chemical power, and is a frequent cause of the disease. Like cold, it may act directly or indirectly. In the one case, topical inflammation is generally the consequence; in the other, various disorders of the constitution. Atmospheric air, noxious gases, acids, alkalies, blisters, rubefacients, animal poisons, contagious

and specific diseases, may likewise be enumerated among the chemical causes of inflammation.

The *mechanical* causes of inflammation are contusions, lacerations, punctures, fractures, luxations, long-continued pressure, and innumerable other agents.*

Every part of the body, with few exceptions, is liable to inflammation; but some parts are more prone to it than others. In general, it may be stated, that the greater the natural sensibility of a part, the more susceptible it is of the inflammatory process.

The *Serous* membranes are particularly subject to inflammation. The danger, in such cases, is often great, and the pain severe. In many instances, adhesions form from the effusion of coagulable lymph, and the functions of particular organs are disturbed or destroyed;—at other times a salutary purpose is answered, as, without such agglutination, certain diseases could never be cured.

The *Mucous* membranes, also, take on inflammation very readily; but the effects are very different from those of the adhesive inflammation. In general, the fluids secreted by mucous membranes, are changed in colour and consistence, according to the degree of inflammation existing in the part.

The *Cellular* membrane, especially the skin, is very susceptible of inflammation, which may be either of the adhesive or suppurative kind.

Inflammation is not easily induced in the *Synovial* and *Fibrous* membranes; when once established, however, the pain is often excessively severe, and the consequences very serious.

The *Bones* are subject to inflammation, and very tedious diseases frequently result; but *Cartilage*, owing to its supposed want of vascularity, can seldom be said to suffer from inflammatory action.

The *Arteries*, *Veins* and *Absorbents*, are all, more or less, exposed to inflammation. The former are capable of resisting the process to a great degree, while the latter readily yield, and may give rise to various diseases of an alarming nature.

* Those who are anxious to investigate the *proximate* cause of inflammation, as it has been improperly denominated, may consult Wilson on Febrile Diseases, Hunter on Inflammation, and Thomson on Inflammation.

TREATMENT OF INFLAMMATION.

In every inflammation, the first object of the surgeon should be to procure resolution; and this may often be accomplished by removing the exciting causes of the disease. Two classes of remedies may be resorted to—*constitutional* and *local*. Among the former, are *blood-letting*, *purgatives*, *diaphoretics*, and *low diet*. Among the latter, *topical* blood-letting, blisters, and other external applications, as well as rest and position.

General blood-letting need only be employed where the inflammation is high and attended with disturbance of the system. The quantity to be drawn will depend upon the violence of the disease and the constitution of the patient. Much will depend, also, upon the part in which the disease is seated. *Vital* parts suffer more readily than others, from *depression* being induced; but *all* vital parts are not equally liable to suffer. A good general rule to observe in all inflammations of the vital organs, is to repeat blood-letting *frequently*, and to draw only a small portion at a time. In this way *depression* will be obviated. With respect to the continuance or omission of blood-letting, the *pulse* will, generally, be found a good guide. If it be full and hard and frequent, and rise after the operation, a repetition may, perhaps, be necessary. There are particular states of the pulse which may lead into error—especially the *oppressed* pulse.* The existence or absence, of the *buffy-coat* will, in many instances, direct us to continue or lay aside blood-letting. Its presence, however, is not always a sure indication of inflammatory action; and, on the other hand, very severe inflammations occasionally occur, without any appearance of the buffy-coat. Perhaps the most certain indication of the presence of inflammation is the continuance of *pain*; and so long as this remains severe, we can scarcely go wrong in the detraction of blood.

Purgatives and *diaphoretics* are very useful auxiliaries to the lancet. The best remedies of the kind are such as produce nausea. The warm bath will, in particular cases, be found extremely serviceable. But, in using it, strict attention should be paid to the degree of temperature.

* See Rush's Works.

In certain cases *opium* may be advantageously employed, especially after the full effect of evacuations has been obtained. It should be given, however, with caution.

As a general remedy, *low diet*, or strict attention to regimen, is, unquestionably, of great importance in the treatment of all inflammatory diseases; and we have every reason to believe, that by attention to this remedy alone, many formidable diseases have been cured, after resisting all other modes of treatment. For the introduction of this practice into the United States, and for a just estimate of its value, the profession is much indebted to the late Drs. Kuhn and Physick.

Among the *local* remedies for inflammation, *topical* blood-letting holds the first rank. It may be performed by *Scarification*, *Cupping*, or *Leeches*. The first is employed only in certain cases; the second is, generally, applied to parts loose and yielding, and not very sensitive; while the third is adapted to almost every external inflammation, and often proves of immense value. The number of leeches must be proportioned to the size of the animals, to the quantity of blood necessary to be drawn, and to the part affected. Unpleasant effects sometimes arise from the bite of a leech.

Blisters are very efficacious in most inflammatory diseases. They should sometimes be applied directly over the part, and sometimes in its vicinity. When small, and frequently renewed, they generally produce better effects than when large, and applied at long intervals. *Sinapisms* and *Issues* are both, occasionally, used in the reduction of inflammation, and will frequently be found useful.

Cold applications, such as the acetate of lead dissolved in water, cold water itself, ice water, a solution of muriate of ammonia in spirit and vinegar, the water of acetated litharge, and other similar medicines, kept to the inflamed part by linen rags, and changed as often as they become warm, will prove eminently beneficial. Cold may often be employed, also, as a constitutional remedy, in inflammatory diseases; but great caution should be observed that it be not too suddenly applied, or to an immoderate degree.* Strange as it may appear, in certain constitutions, and in inflammations of particular parts, cold applications do mischief, and the disease is only benefited by

* See Currie's Medical Reports.

fomentations and *warm* poultices. Whenever such effects are found to follow, the cold should be discontinued instantly, and warmth substituted in its place.

Rest and *Position* are of immense consequence in the treatment of inflammation. How often do we see a very trivial accident, for want of attention to these important points, converted into a troublesome and dangerous disease! Whilst an inflamed or injured part is kept still, the restorative process goes on without interruption; when the part is in motion, reproduction takes place very slowly, owing to irritation, and in many instances is never accomplished. *Position*, by diverting the blood, and keeping the vessels of the inflamed part comparatively empty, may be employed, in almost every situation, and in the extremities especially,—which should always, under these circumstances, be *elevated*,—will prove of inestimable value.

Consult Hunter on Inflammation, 4to edit. 1794; Burns' Dissertations on Inflammation; Thomson's Lectures on Inflammation; Wilson on Febrile Diseases; Philips' Experimental Inquiry into the Laws of the Vital Functions; Parry's Experimental Inquiry into the Nature of the Arterial Pulse; Broussais' Hist. des Phlegmasies ou Inflammations Chroniques; The Principles of Surgery, by John Burns, vol. i. London, 1831; A Treatise on Inflammation of the Mucous Membrane of the Lungs, by C. Hastings, London, 1820; Observations on some of the General Principles and on the particular Nature and Treatment of the different species of Inflammation, by J. R. James, of Exeter, London, 1821; Macartney on Inflammation, &c; Andral on Ulceration, in Précis d'Anat. Patholog. tom. i.; Key on Ulceration, in Med. Chirurg. Transact. vol. xviii.; Wallace on Venereal Disease; Gaskell in London Medical Gazette, vol. xvi.

SECTION I.

SUPPURATIVE INFLAMMATION.

WHEN inflammation does not subside spontaneously, or by the use of the remedies pointed out, other symptoms, in a greater or less time, take place. The redness assumes a brighter hue, the swelling increases, becomes more pointed and softer, the

pain is materially augmented, and the patient distressed by the pulsation or throbbing.

Besides these local symptoms, constitutional ones soon make their appearance. Rigor or shivering is a very common occurrence, even when the inflammation is slight. It seldom occurs at regular periods, and is sometimes, in severe inflammations too, hardly to be observed for many hours or days. Rigors often exist for a considerable time previous to the establishment of suppuration. Their presence is almost a sure indication that pus is about to be formed. When once it is formed, other changes take place; the pain and redness diminish, the swelling fluctuates, especially at its apex, and a cavity or abscess is created, which encloses the matter. Purulent matter, however, is frequently formed on surfaces, and in situations where it is not confined by an abscess. It was formerly supposed that pus could not be created except through the medium of the *ulcerative* process. But this opinion was proved to be erroneous by Dr. Hunter. Many believe that pus may be formed, in certain cases, without preceding inflammation. For various reasons such an opinion should be discountenanced.

Pus, when healthy, is of a light yellow or cream colour. It is made up of small globules, which float in a watery fluid, and has a strong tendency to putrefaction, especially when mixed with extraneous matter. Pus possesses neither alkaline nor acid properties. *Unhealthy* pus has received different appellations, expressive of the particular changes it has undergone. *Ichor* is a thin and exceedingly acrid discharge. *Sanies* is a very fetid ichor mixed with the red globules of blood. *Sordes* is of a leaden colour, very offensive, thick and apparently coagulated. *Malignant* matter is generated in pestilential diseases, has a peculiar smell, but does not communicate specific disease. *Contagious* matter has the power of contaminating parts to which it is applied, and of always producing a disease of the same character.

Many attempts have been made to distinguish *Pus* from *Mucus* and from other animal matter, without a satisfactory result,—owing to the vague and uncertain operation of chemical agents, when applied to the investigation of disease and of the products of the living body. Disputes have also arisen, respecting the *formation* of pus; some supposing it to be the result of a *putrefactive* process; others that it proceeds from the *dissolution* of the

inflamed part; and others, again, that it is produced by a *secretory* action. The last opinion, which there is reason to believe was originally suggested by Dr. Simpson of Scotland, seems the most probable. The first detailed account of the doctrine was given by the late Dr. Morgan of this city, in his inaugural thesis, published at Edinburgh, in 1763. Mr. Hunter, also, contends, that pus is a secretion, and has furnished many strong arguments in support of his opinion.

Hectic fever may accompany any inflammation, but is commonly met with during the suppurative stage. It commences with nausea and a slight chill, which are succeeded by flushes of heat and an increase of pulse. A sweat then breaks out, continues several hours, and is particularly troublesome during the night. After hectic has lasted some time, other symptoms make their appearance, such as a circumscribed red spot on each cheek, and a burning, tingling sensation in the palms of the hands and soles of the feet. The pulse becomes very weak and quick, and the urine high-coloured and full of sediment. To these symptoms succeed flatulence, indigestion, and diarrhœa. An opinion formerly prevailed, that hectic always arose from the absorption of purulent matter. Mr. Hunter has put this question to rest, and proved by a number of well-attested facts, that the fever often exists independently of the suppurative process, and accompanies many diseases very opposite in their nature.

TREATMENT OF SUPPURATIVE INFLAMMATION.

As soon as it is ascertained that inflammation *must* terminate in suppuration, the remedies employed for its reduction should be abandoned at once, and those substituted which promote the purulent secretion. For this purpose, general means, as well as local, may be employed. The former are seldom necessary, unless the patient has been much enfeebled by evacuations. In that case, we substitute a better regimen, and employ tonic medicines, mineral acids and opium.

As *local* applications, fomentations and warm poultices are indispensable. Poultices are more useful than fomentations, as they retain their heat longer, and are more easily applied and renewed. The heat of a poultice should somewhat exceed that of the inflamed part. After the discharge of the matter, the

poultice should still be continued for some time. Frequently an unnecessary and profuse discharge is kept up; in that case mild dressings must supersede the use of the poultice.

Hectic cannot, always, be removed radically. When it proceeds from some local disease, curable by an operation or by other means, the fever will speedily terminate after the disease has ceased. When the *hectic* cause is such as not to admit of removal, the surgeon can do no more than alleviate the urgent symptoms. The proper medicines are bark, wine, opium, digitalis, and the acids. Animal food is injurious; but vegetables, if not highly seasoned, prove very useful. Dr. Brocklesby* has commended the free use of Seltzer water, to relieve the symptoms of *hectic*.

See Home on the Properties of Pus, in Observations on Ulcers, p. 13, edit. 2d, 1801; Hunter on Inflammation, p. 371—415, 496; G. Pearson's Observations and Experiments on Pus, in the Philosophical Transactions, 1811; Darwin's Experiments, establishing a Criterion between Mucilaginous and Purulent Matter, 1780; Thomson on Inflammation, p. 308—312—323.

SECTION II.

ULCERATIVE INFLAMMATION.

It has been well remarked by Mr. Hunter, "that whenever any solid part of our bodies undergoes a diminution, or is broken in upon in consequence of any disease, it is the absorbing system which does it."† The term *ulcerative absorption* was, therefore, invented by that great pathologist to express that morbid process by which the continuity of the different textures of the body is destroyed. By the ancients it was denominated *erosion*.

Every texture of the body is, perhaps, liable to ulceration, but the *skin* and *mucous* membranes suffer more readily than other parts. This may be exemplified by the extensive erup-

* Medical Observations and Inquiries, vol. iv. p. 7.

† Page 442.

tions and blotches, which not unfrequently cover the greater part of the body, and by the sores which follow inflammation of the stomach, intestines, œsophagus, Schneiderian membrane, urethra and vagina. The *synovial* membranes often suffer from ulceration, but it is seldom that the disease originates in muscles, fasciæ, blood-vessels, or nerves. The *bones* very readily take on the ulcerative absorption, and sometimes are rendered by it extensively carious, or else are entirely destroyed. More or less pain is always a concomitant of the ulcerative process. It is, generally, lancinating; though this will depend much upon the texture in which the disease is seated. The worst species of ulcerations result from specific inflammation. Previous inflammation is essential to the existence of the ulcerative process, and this inflammation is generally of the simple kind, or that which Mr. Hunter has called the *adhesive*. In many instances, however, it follows suppuration and gangrene.

The *treatment* necessary in the ulcerative inflammation must depend upon a variety of circumstances—such as the constitutional or local origin of the disease, its specific nature, its duration, &c.; all of which will be considered under the head of *Ulcers*.

See Hunter on Inflammation, p. 439; Thomson on Inflammation, p. 349; and Andral, Key, Wallace, Gaskell, &c.

SECTION III.

MORTIFICATION.

GANGRENE and sphacelus have been employed by some writers to express the same disease—by others, to comprehend different stages of it. Gangrene, as the term is now generally used, is intended to denote that condition of a part which immediately precedes its destruction. By the word sphacelus, the complete death of a part is understood. The general term *mortification* I shall retain, to designate both stages of the complaint.

When an inflamed part, instead of terminating by adhesion, suppuration, or by some of the other modes formerly pointed out, loses its sensibility, heat and colour, its vitality is extinguished, and mortification ensues. These changes seldom take place suddenly; but are generally preceded by an increase of pain, of a pungent burning kind. The swelling also is increased, the blood still circulates in the larger vessels, the skin becomes soft and of a dark red or purple colour, and vesicles containing a thin serum, are formed beneath the cuticle.

Along with these local symptoms there is constitutional disturbance. The pulse is quick and tremulous, and of the typhoid character. The tongue is dry and of a brownish tinge, the skin very hot, and the patient restless and uneasy. Delirium, subsultus tendinum, nausea and hiccup frequently supervene. The part soon becomes cold and insensible, and sphacelus is completely established. If a vital part has suffered, the patient often dies; but sometimes it happens, that the constitutional symptoms slowly or suddenly yield; a red line is formed at the junction of the living and dead parts, the latter are separated by *ulcerative absorption*, granulations sprout up, and the patient may recover,—provided the constitution has not been too much weakened by the violence of the disease.

Mortification is said to occur sometimes without previous inflammation—from suspension of the circulation by ligatures, and from ossification of the arterial trunk. There is some reason to believe, however, that, even in these cases, more or less inflammation really takes place, and that, in many other instances, although the common symptoms—pain, redness, and swelling—be not strongly marked, yet the inflammatory process is present to a certain extent, and contributes to the mischief which ensues.

Almost every texture of the body is liable to mortification; but *mucous* membrane, the *skin*, and *absorbent* vessels are particularly apt to suffer—while the arteries, tendons, ligaments, and fibrous membranes, generally escape.

The *causes* of mortification are innumerable; in general, the disease results from inflammation. Gun-shot wounds, fractures, dislocations, simple punctures, concentrated acids, poisons, stimulating applications, infiltration of acrid fluids into the cellular membrane, lightning, burns, long-continued pressure, intense cold, must all operate, more or less, through the medium

of inflammation, in producing their several effects. There are some *specific* causes of mortification, which will afterwards be noticed.

TREATMENT OF MORTIFICATION.

The remedies for mortification are either *constitutional* or *local*; and those of a very opposite character must be employed under particular circumstances. If, for instance, there be high inflammation which is likely to terminate in gangrene, the antiphlogistic system should be enforced: on the contrary, if gangrene has actually taken place, then a different practice will become necessary. We give bark and wine and other tonics, soups and nutritious food of every description. *Opium* will also be found advantageous, if administered in small doses, and frequently repeated.

Formerly greater reliance was placed upon *bark* than any other medicine; but of late years, its reputation in this particular disease has greatly declined—so much so, that many modern practitioners look upon it as altogether inert. In particular cases I have found it useful, and in others useless, if not injurious. *Musk* and *volatile alkali*, were recommended, many years ago, by Mr. White of Manchester, as extremely useful in cases of mortification attended with spasmodic twitchings. The latter medicine I have frequently employed with advantage. I have, also, prescribed *camphor*, either alone or combined with opium, and have generally found that the patients were relieved by it. The *mineral acids* are occasionally administered. They act, however, only as common tonics, and as such may be beneficial. In some cases great benefit will be derived from small doses of the submuriate of mercury. The same may be said of the internal use of the liquor ammoniæ acetatis combined with laudanum.

As *local* remedies, numerous applications were formerly made to mortified parts, under an impression that the progress of the disease might be checked, or the vitality of the texture restored. It is now, however, well understood, that no such influence can be exerted, and that local remedies are chiefly useful in assuaging pain and keeping the diseased part clean, moist, and free from fœtor. Such applications, indeed, may be useful during the height of the inflammatory stage, and before gan-

grene has taken place. The best, under these circumstances, are common poultices of bread and milk, moderately warm, and kept constantly applied. Fomentations are sometimes employed with the same view; but they are not so useful as poultices. In the early stages of gangrene, leeches applied directly to the part or its neighbourhood often prove highly beneficial.

When mortification has commenced, and particularly when the cuticle is elevated in spots by a serous fluid, solutions of *sugar of lead*, or mild *ointments*, or a mixture of *lime-water* and oil, will be found very soothing. They should be applied by a camel's hair pencil, or by a feather, and care taken to preserve the cuticle entire. When the skin separates, and the surface discharges an offensive matter, then *carrot poultices* mixed with *yeast*, or the *fermenting cataplasm*, will prove extremely useful. In a few cases I have known the patients complain very much after the carrot poultice has been applied, and relief to follow its removal. Most writers recommend powdered *carbon*, either alone or mixed with a poultice. I have seldom derived much advantage from it; and as it keeps the part to which it is applied black and dirty, so that its real condition cannot always be ascertained, it should, if possible, be dispensed with. A better application, to correct fœtor and to keep the part clean, is the *pyroligneous acid*. I have several times employed this medicine, and particularly in sloughing ulcers and tumours, just before an operation, and have been able, almost instantly, to remove any offensive odour.

The older surgeons were in the habit of *scarifying* all mortified parts, under the idea, that such process would speedily promote their separation. Except in cases of extravasation of urine into the cellular texture of the scrotum, and some other analogous diseases, such an operation is never at the present day performed. Neither will any benefit result from the practice, so common in former times, of applying highly stimulating medicines, such as turpentine, spirits, &c. Indeed, in many instances, manifest injury must be the consequence, especially when the progress of the disease has been stopped, and the sound parts are making efforts to cast off the dead. In such cases, very severe pain follows every dressing, and there is reason to believe that the disease has sometimes been re-established by the continuance of so absurd a practice. *Emollient poultices* will prove more useful in this stage of the disease, than any other

applications. To stop the progress of mortification, Dr. Physick has employed, ever since the year 1803, *blisters*, large enough to cover the affected part and a considerable portion of the adjoining sound parts, and has, in many instances, found the practice extremely beneficial.

When patients are confined for a long time in one posture, from fractures, paralysis, typhus fever, and other diseases, mortification is very apt to take place in patches on the back and hips. All that can be done, in such cases, is to cover the sores by *adhesive plaster*, and to place bolsters or cushions under the body, so as to change the position of the patient and restore circulation to the injured part.

Amputation is now seldom employed to stop the progress of mortification; for experience sufficiently proves that the disease is afterwards liable to fall on the stump. When a red line has formed, at which the dead separate from the living parts, an operation will become necessary, in order to remove the bone and form a proper stump. But this should seldom be done, until the system has, in some degree, recovered its tone. These points, however, will be discussed under the head of *Amputation*.

See Kirkland's Inquiry into the present State of Medical Surgery, vol. ii. p. 291; Larrey's Memoirs, translated by Hall, vol. ii. p. 205; Thomson on Inflammation, p. 501.

SECTION IV.

CHRONIC MORTIFICATION.

By this term I shall designate that particular disease described by Pott, as attacking "*the toes and feet*." It differs, in some respects, from common mortification, and is chiefly met with amongst aged persons, although young ones are, by no means, exempt from it. Males, also, are more subject to the disease than females. A small bluish spot is first observed on the inside of one of the toes, from which the cuticle soon separates. This

spot spreads in every direction with greater or less rapidity. Sometimes all the toes are attacked simultaneously; in other cases the disease extends gradually from one toe to the other, and thence to the foot and leg. Its progress, in some subjects, is very rapid, in others protracted. Some patients experience excruciating pain,—others suffer very little. I have known three instances in which the patients were not aware of the existence of the disease until one or more of the toes were extensively affected. In one of the cases, the disease seemed to have been brought about by the lodgement of a needle beneath the nail of the great toe. The needle had been carelessly left in a darned stocking, and had penetrated the toe without the patient being sensible of it,—so that its discovery was purely accidental. His constitution had been previously much impaired by intemperance and free living.

According to Pott, the majority of patients labouring under this complaint, feel great uneasiness, especially at night throughout the ankle and foot, before any discoloration takes place. When once the mortification is fairly established, the patient's constitution sinks rapidly. He is very restless, cannot sleep, is often delirious, and complains of spasmodic twitches. The soft parts gradually separate, or are easily detached, and the bones drop from each other at the joints. The smell of the dead mass is often very offensive, and is sometimes complained of by the patient himself. In almost all the cases I have seen, death has taken place soon after the mortification reached the ankle.

The *causes* of this disease are quite obscure. Cowper first suggested the idea of its being dependent on ossification of the arteries. Dr. Thomson and others have confirmed the fact—that such condition of the vessels is generally met with in chronic mortification: but Mr. Hodgson's* assertion, “that it is a constant attendant,” remains yet to be proved. Mr. Pott met with the disease chiefly in gouty subjects.

TREATMENT OF CHRONIC MORTIFICATION.

Formerly, bark was as much employed in this variety of mortification, as in any other form of the disease. It was condemned,

* On the Diseases of the Arteries and Veins, p. 41.

however, by Mr. Pott, as useless, if not hurtful; and on this account is now seldom employed. Instead of bark, Mr. Pott recommended opium, which he has praised in the highest terms. I have tried this medicine, however, repeatedly, both in small and very large doses, and although I have found the pain and urgent symptoms sometimes relieved by its use, I cannot say that it has equalled the expectations held out by Mr. Pott in a single instance. A female patient, thirty-five years of age, in the Hospital, during the summer of 1822, suffered for several weeks under this complaint. I commenced with moderate doses of opium, and gradually increased the quantity until she took five hundred drops of laudanum every twelve hours; yet little relief was experienced, and she died some weeks after in a dreadful condition. Bark was also given, both in substance and in the form of extract, without any advantage. Another woman, in the same Institution, whom I attended for the complaint, at the same time, was cured (with the exception of the loss of the greater part of the foot,) I have reason to believe, by large doses of volatile alkali and by camphor, after opium had failed. Dr. Kirkland condemns the use of opium in large doses in this disease, and says that he has often known the mortification removed under the use of anodyne tonics, when its internal use was discontinued, because it brought on delirium and took away the appetite. The same practitioner seems to depend, rather, upon mild nutritious articles of food, than upon medicine, for the cure of this complaint.*

Various local applications may prove serviceable,—not in stopping the disease, but in relieving pain, and in keeping the parts moist and free from fœtor. Milk alone, or milk and water, moderately warm, and frequently applied, will be found very grateful to the patient's feelings. A bread and milk poultice I have used in several cases with advantage, where the carrot and turnip poultices gave pain. Dr. Dorsey† states, “that in the only case he ever saw, the application of a blister produced an immediate termination of the mortification.” In the worst of the Hospital cases, mortification followed the day after the blister was applied, and in a part apparently sound before its use;—in the other no benefit appeared to result, although the blister was applied repeatedly for several days. Blisters have been

* Kirkland's Medical Surgery, vol. ii. p. 423.

† Elements of Surgery, vol. i. p. 29.

known to bring on mortification in other diseases under particular circumstances, and however useful they may prove in common gangrene, I should not feel inclined, from what I have seen, to recommend them in chronic mortification. When the complaint occurs in people considerably advanced in age, I believe that all our efforts will prove unavailing. Amputation has sometimes been resorted to,—but generally without effect.

Sir Astley Cooper condemns amputation altogether in this disease. “In these cases,” says he, “you must not amputate; whether there be healthy granulations or not, do not amputate; for as surely as you do, mortification of the stump will supervene, and death quickly ensue.”

In a communication lately received from Dr. J. T. Pitney, of Auburn, New York State, I am informed that he has succeeded in several instances in stopping the progress of the disease and effecting a cure, by amputating above the *middle of the thigh*, instead of the leg. This is to me a novel idea and practice, and at least deserving of other trials.

See Pott's Works, vol. iii. p. 185; Thomson on Inflammation, p. 533; James on Inflammation, p. 296; Kirkland's Medical Surgery, p. 418; Cooper's Lectures by Tyrrel, vol. i. p. 239.

SECTION V.

DRY MORTIFICATION.

THE dry mortification is, in every respect, a very singular affection. Without previous swelling, redness or pain, the toes and feet lose their heat, become shrivelled, discoloured, and finally, converted into a hard, dry, insensible mass, of a dark blue or very black colour. In general, no sloughing takes place; on the contrary, each part retains its original form, the skin remains entire and the nails adhere to the toes. To the touch the whole affected part feels cold, as hard as a common smoked tongue, and is perfectly free from fœtor.

In some patients, the disease begins suddenly with a burning sensation, which continues for several days, and then as suddenly ceases. In others, the pain is violent, the fœtor and sloughing considerable, and attended with severe constitutional symptoms. For the most part, however, the general health is little disturbed, and the disease continues its course until a line of separation is formed. It seldom proceeds farther than the knee, though in a few instances it has reached the hip, or extended to the body, and proved fatal.

This variety of mortification often arises without any evident cause. It can be traced, however, in numerous instances to vitiated grain, especially rye. During very moist seasons, a substance called *ergot*, *secale cornutum* or *cockspur*, is sometimes generated in considerable quantity, forming a disease, in which the grains of rye become of large size, firm consistence and black colour. This being mixed with sound rye, is often eaten by whole families, and for some time without inconvenience. In consequence of large portions being taken, the dry mortification is at length produced in the feet, legs, hands, or other parts of the body; and in some European countries, especially France, has appeared in certain districts as an endemial disease.

For a considerable time, doubts were entertained as to the real origin of the disease, and many were disposed to believe that its production was totally independent of the ergot. On this account, the Royal Society of Medicine, of Paris, requested M. Tessier, one of its members, to visit those districts in which the complaint was very prevalent, and endeavour to settle, by experiment, the point in dispute. For these experiments, a number of the inferior animals were selected, none of which would voluntarily eat the ergot, however disguised by the admixture of other food. All were, therefore, compelled to take it, and its effects upon each corresponded with the quantity administered—mortification in some being readily induced, in others tardily, and proving fatal to the whole, in the course of a few days or weeks. These experiments of Tessier have since been so frequently repeated by others, as to leave no doubt whatever on the subject, and authorize us to conclude that the dry mortification, in the greater number of instances, proceeds from the above-mentioned cause.

Were any further illustration necessary to show the power of ergot in the production of dry gangrene, some very interesting

facts might be detailed in relation to the disease, as it appeared among the horned cattle, many years ago, in Chester county, in this State, and in Orange county, State of New York, in 1819 and 1820. Dr. Mease,* a gentleman well known for his extensive researches, and who has paid particular attention to the diseases of domestic animals, was the first to record the fact—that the dry mortification, affecting the legs of cattle, in the instances referred to, proceeded from the use of the *green grass*, (*poa viridis*,) the ends of the seeds of which, to some extent, were affected with the smut or ergot. Lately, a very interesting account of the same disease, and a confirmation of Dr. Mease's statement, has been given by Dr. Arnell.†

I have met with two or three examples of the genuine dry mortification in this country, neither of which, as far as could be determined, arose from the spurred rye. In one instance, the disease appeared to be the consequence of fracture—the patient, at least, had received a fracture of both thighs, and of the left leg, from which he recovered in four or five months. At the end of that time, a dark spot appeared on one of the toes of the right foot, spread thence to the other toes, and finally involved the greater part of the leg, which became perfectly cold, insensible, dry, hard, withered, and of a deep purple colour. The skin remained entire, except at the upper part of the leg, where it sloughed, along with a portion of the muscles. In this condition the patient remained several months longer, without pain or material injury to his general health, when I was requested to visit him at York, Pennsylvania, in consultation with Dr. Spangler of that place. It was decided that amputation alone could afford relief. I accordingly performed the operation, (on the 16th January, 1816,) immediately below the knee, and with complete success. Ever since that period the limb has remained in my surgical cabinet, exposed constantly to the air, is now perfectly free from fœtor, as it was, indeed, at the time of the operation, and has never since undergone the slightest change.‡ There is every reason to believe, in this case, that the mortification was the result of the different frac-

* Domestic Encyclopedia, vol. ii. p. 52, and vol. iii. p. 196.

† The Plough Boy and Journal of the Board of Agriculture, by S. Southwick, vol. iii. p. 41.

‡ Latterly it has been somewhat worm-eaten.

tures, for upon repeated inquiries, no evidence was afforded that the patient had ever lived upon damaged grain of any description: on the contrary, he was a wealthy farmer, and had always used the most wholesome articles of food.

A beautiful specimen of dry gangrene was presented to me during the winter of 1827, by Dr. E. Swain, of Bristol. It occurred in the practice of Dr. Phillips, an eminent physician of that borough. The patient was seventy-two years of age, and had long been subject to extensive ulceration of the ankle. The disease commenced in the toes, and gradually extended over the foot, which finally separated from the leg. She lived five weeks afterwards, and during the whole course of the disease experienced no pain.

TREATMENT OF DRY MORTIFICATION.

The dry is not so fatal a disease as the chronic mortification. Where it has prevailed endemially, however, very few have recovered. In favourable cases, and in young subjects, *amputation* has often succeeded, and under any circumstances must be considered the chief remedy.

The following case, in which that operation was employed, (by Dr. Carmichael, an accomplished physician of Richmond, Virginia, and by whom the particulars were obligingly communicated to me,) will be read with interest:

“Henry Krebs, major of the French army, passed through the disastrous retreat from Moscow, without more suffering than fell to the lot of a small part of the retreating force. In the year 1818, he emigrated to this country, and, from that time to the present, has devoted himself to instruction in music; to this occupation he has added great mental labour; being a devoted mathematician in the higher branches, and in botany. His health has, through this period, been good, his complexion sallow, but his general constitution may be said to equal that of the larger portion of society. These preliminary remarks have been suggested with the view of presenting the influence they may have had, in producing the unusual disease with which he was attacked in January last.

“Without any indication whatever, this gentleman was seized,

during the night, with the most violent pain in both feet, and so great was the suffering that he uttered the most distressing screams; upon examination, the appearance of the parts did not authorize to our eyes the agony he expressed. In the morning, however, we were startled at the more than cadaverous coldness of both feet, and the partially ecchymotic state of them; a farther examination soon satisfied us of the total absence of arterial circulation, and our diagnosis fixed on dry gangrene.

“When this fact had been established, a difficulty arose with it. We had been taught, most generally, to look for this in the old, and exhausted constitution; here the subject was young, heretofore in good condition, and we farther inferred that the treatment of Pott, however applicable to the former patients, was ill-suited to this. As no medium ground could be well occupied between Dupuytren and this old but respectable surgeon, I unhesitatingly embraced the pathological doctrine of the Baron. But before putting it into practice, I thought fit, against my usual custom, to read to Mr. Krebbs these new views, with which he was immediately struck, and forthwith bared his arm for the lancet. The first bleeding, to faintness, afforded great relief from the pain, as it did on every trial, which was repeated during the disease not less frequently than eight or ten times. Purgatives, assisted as usual, in the antiphlogistic treatment, and the most agreeable local adjuvant was snow or iced water: whenever any prescription of a raised temperature was applied, the pain was aggravated, and the gangrene extended.

“The detailed description in this case, is important only as it exemplifies the successful application of the lancet in a disease heretofore supposed to be invariably connected with debility, as also its spontaneously arising upon such a constitution as that of this individual: whenever the blood was drawn, which I have stated before to be frequently, the patient was greatly relieved, and on several of these occasions, it was by earnest solicitation. It was always buffed and cupped. Opium was sparingly used, and not on any occasion was it fully given. About the sixth week, I removed one of his legs just below the knee, and upon an inspection of the artery, it was found so filled with granulated, albuminous or fibrous matter, that no ligature was applied, or tourniquet used, nor was there the least hemorrhage, though the circular flap operation was selected, and the healthy

parts the seat. Slight delirium followed; this soon subsided under the treatment by opium, and on the tenth week the other limb followed the fate of the first: from that hour to the present, he has gradually improved, and is now in a state perfectly convalescent.”*

See Thomson on Inflammation, p. 538; Boyer's Treatise on Surgical Diseases, translated by Stevens, vol. i. p. 77; Gooch's Works, vol. ii. p. 367; Prescott on the Natural History and Medicinal Effects of the *Secale Cornutum*, &c. 1813.

* He died, however, shortly afterwards.

CHAPTER II.

VARIETIES OF INFLAMMATION.

After the account given of common inflammation and its terminations, it will be proper to notice certain diseases, which differ in many respects from the original affection, and from each other. These affections, there is reason to believe, are very often dependent upon constitutional peculiarities; but in other instances, they result evidently from some particular local irritation. The most common varieties of the disease are erysipelas, boil, carbuncle, chilblain, frost-bite, and burns, each of which it will be proper to treat of in separate sections.

SECTION I.

ERYSIPELAS.

A GREAT diversity of opinion has prevailed among writers respecting the nature and seat of erysipelas. Some, indeed, contend, that the relation between it and inflammation is very remote.* This statement is probably without foundation, though it must be confessed that our knowledge of the complaint is very imperfect.

Erysipelas commonly attacks some part of the cutaneous texture, and exhibits the following appearances. The surface of the affected part is elevated and of a bright scarlet colour, mixed occasionally with yellow and dusky red, and having an abrupt termination. The redness is accompanied by a burning

* See Pearson's Principles of Surgery, p. 187.

sensation, or by itching. When pressure is made upon the swelling, the redness disappears, leaving a white spot in its place. The redness, however, is quickly restored upon the pressure being removed. In some cases small vesicles, containing an acid serum, appear on the diseased surface.

Erysipelas is not always attended by constitutional symptoms, but, generally, more or less rigor, fever, nausea, headach, and loss of appetite precede the complaint. These symptoms cease about the third day, and the redness and swelling soon after take place. In mild cases the cuticle separates in flakes, and the skin beneath assumes a healthy aspect. When vesicles form, they either dry up and desquamate, or else terminate in ulceration or sphacelus. Erysipelas differs, in many respects, from phlegmon: in certain cases, however, the two affections are combined.

Authors have enumerated various species of erysipelas, and have designated each by particular names. Some of these species, it appears to me, are imaginary, and others to be considered as accidental symptoms only of the complaint. Were I to follow the arrangement of any individual writer, it should be that of Pearson,* by whom the disease has been divided into three species—acute, œdematose, and malignant erysipelas.

Very often erysipelas arises without evident cause, and spreads rapidly from one part of the body to another. In other instances, the disease can be traced to the operation of some specific agent—such as the application of vegetable, animal, or mineral poisons—to wounds, fractures, exposure, intemperance, derangement of the digestive organs, violent passions of the mind, contagious diseases, impure air, &c.

That erysipelas is not confined, as contended by some writers, to the cutaneous texture, is rendered probable by the circumstance of its attacking, occasionally, the mucous membrane of the cheek, rectum, Eustachian tube, and other similar parts.

TREATMENT OF ERYSIPELAS.

In the commencement of the attack, blood-letting, purgatives, diaphoretics and low diet will be found the most appropriate

* Principles of Surgery, p. 167.

remedies. Leeches, in most instances, should be preferred to general blood-letting. The French have long employed this remedy with great advantage in erysipelas, and the practice is still recommended by their best authorities, especially by Broussais. Dr. Neill, an eminent practitioner of this city, has detailed several cases in proof of the efficacy of this mode of treatment.* Desault and Boyer extol the use of emetics in that variety of erysipelas denominated *bilious*. After full benefit has been derived from the antiphlogistic plan, opium, bark and camphor may, perhaps, become necessary; at all events, care must be taken that the evacuations are not carried too far, otherwise, the disease may terminate in mortification. When erysipelas occurs in persons debilitated by the immoderate use of ardent liquors, it will be found expedient in most cases of the kind to continue such articles, otherwise the patients are almost sure to sink.

As local applications, weak solutions of the acetate of lead, cold water, and other similar means, often prove beneficial. Blisters are extremely efficacious, but should not be applied, according to Pearson, upon the diseased surface, on account of the troublesome sores which sometimes follow. Such effects I have never witnessed, although, in numerous instances, I have covered the inflamed part with a very large blister. Warm solutions of opium, frequently applied, I have found very useful in allaying the peculiar burning pain and itching, which so commonly attend the disease. But of all local applications the *mercurial* ointment is, undoubtedly, among the best. It was first introduced into practice in this complaint, by Drs. Dean and Little, of Chambersburg, in this State. A practice very commonly prevails, in the preparation of this medicine, of mixing with it turpentine and other stimulating ingredients. It is said that ointment, thus prepared, if used in erysipelatous inflammation, will increase rather than alleviate the disease; but when divested of such materials, it speedily relieves every urgent symptom, especially in that troublesome form of the complaint which so frequently attacks the face.

Within the last few years, I have frequently employed in erysipelas, and with most decided benefit, the preparation known under the name of *British oil*. It is singularly useful in removing

* North American Medical and Surgical Journal, vol. i. p. 295.

the itching that usually accompanies the disease. In this respect, I know of no local application at all equal to it. Dr. Benjamin Coates informs me, that he has often used, with great effect, the tar ointment in obstinate cases of erysipelas.

Most practitioners recommend, as external applications, various powders, such as starch, flour, chalk, and impure carbonate of zinc. I have seldom found these articles useful; but, on the contrary, often injurious,—by mixing with the fluids discharged from the vesications, and forming crusts or scabs, which irritate the subjacent skin.

For the treatment of erysipelas combined with phlegmon, a practice has lately been introduced by Dr. Hutchison, of making numerous longitudinal incisions an inch long down to the muscles, in the early stages of the disease, in order to give free vent to the secretions, which are apt to form and collect in sacs. Dr. Hutchison states, that during five years in which the practice was employed at the Deal Hospital, not a case was lost.

From considerable experience in this disease, both in hospital and private practice, I can confirm Dr. Hutchison's statements. Compression with bandages, as recommended by Velpeau and Bretonneau, I have seldom found useful. Velpeau also recommends the external application of sulphate of iron, both in the form of ointment and solution. The nitrate of silver, as employed by Higginbottom, I have frequently known to prove serviceable. Dr. W. D. Brincklé, of this city, has very successfully used it in numerous instances, in the proportion of twelve grains to the ounce of water, applied by a camel's hair pencil or by small strips of muslin.

See Pearson's Principles of Surgery, p. 186; Desault's Works, translated by Smith, vol. i. p. 502; Boyer's Treatise on Surgical Disease, by Stevens, vol. i. p. 320; Bateman's Practical Synopsis of Cutaneous Diseases, p. 125; Hutchison's Practical Observations on Surgery; Hutchison, in Medico-Chirurgical Transactions, vol. v. p. 278; James on Inflammation, p. 234; Cooper's Lectures, by Tyrrel, vol. i. p. 244; Observations on the Nature and Treatment of Erysipelas, illustrated by Cases, by W. Lawrence, Surgeon to St. Bartholomew's Hospital, &c. &c., in London Medico Chirurgical Transactions, vol. xiv.; Higginbottom on Nitrate of Silver.

SECTION II.

FURUNCULUS, OR BOIL.

THE furuncle is a hard, painful, and highly inflamed tumour, of a conical shape, the base of which is below, and the apex slightly elevated above the level of the skin. The colour of the tumour is of a dusky red, inclining to purple, and its summit is tipped by a whitish pustule or eschar, beneath which is lodged a mass of disorganized cellular membrane, commonly called a *core*. Although this tumour always terminates in suppuration, its progress is slow, and the matter never assumes a healthy aspect, but is thick, sanious, and ill-conditioned.

Boils may occupy the cellular tissue of any part of the body. Sometimes they are very numerous, and though seldom attended with danger, may occasion great inconvenience to the patient. They arise without evident cause, and frequently in healthy constitutions. At other times, they follow eruptive diseases, and typhus fever.

TREATMENT OF FURUNCULUS.

It is seldom possible, even in the commencement of this disease, to procure resolution; and when accomplished, the tumour is very apt to return repeatedly, and can only be removed eventually, by the establishment of suppuration. On this account, it is better in every instance to encourage this process at once, by the continued use of warm poultices or fomentations. As soon as the apex of the swelling becomes soft, an opening should be made into it, sufficiently large to enable us to remove the core; after which poultices may be reapplied, or else the cavity filled with lint, spread with stimulating materials—such as red precipitate mixed with basilicon ointment. A solution of lunar caustic, in the form of injection, I have sometimes used, advantageously for the purpose of stimulating the cavity, and causing it to fill up.

See Lassus *Pathologie Chirurgicale*, tom. i. to p. 15; Pearson's *Principles of Surgery*, p. 70.

SECTION III.

ANTHRAX, OR CARBUNCLE.

THE carbuncle, in some respects, resembles the furuncle. It is a deep-seated, circumscribed, hard and very painful swelling, of a livid hue, attended with excessive pruriency and burning heat. From furuncle it differs, in having no central core, and in terminating by slough instead of suppuration. Symptoms of common inflammation sometimes attend the commencement of the complaint; but these are soon superseded by vesications, containing an acrid, sanious fluid, which is discharged from numberless pores, occupying every part of the surface of the tumour, and communicating with cellular cavities in a mortified state.

Constitutional symptoms not unfrequently attend this disease from its commencement to its termination. In particular there is nausea, loss of appetite, fever, great prostration of strength, want of sleep, to such an extent as in some instances to destroy the patient. But most persons recover from the attack, after having suffered immensely. When situated on the head, carbuncles are almost sure to prove fatal, by giving rise to effusion and consequent compression of the brain. Professor Cooper of the London university mentions an instance of his having once attended an elderly man, who had a carbuncle as large as a dinner plate over the scapula, and who died of Phlebitis and abscess in various organs.

TREATMENT OF ANTHRAX.

Very opposite modes of treatment must be pursued, in the incipient and advanced stage of carbuncle. In the former, all irritating applications prove highly injurious; whilst in the latter, certain stimulating remedies can alone be depended upon. An emollient poultice in the commencement affords more relief than any other application, and should be continued until vesications appear on the surface. Sometimes it will be found useful to make one or more incisions over the surface of a carbuncle; and afterwards apply an astringent poultice. To assuage pain

and procure sleep, opium must be freely employed; and where the patient is much debilitated, bark, elixir of vitriol, ammonia, and an invigorating diet, are the proper remedies. Blisters* have been highly extolled in the treatment of carbuncle; but I have never found them useful, except in abating the pain attendant upon the disease.

When openings form and discharge a bloody serum, the poultice should be laid aside, and the surface of the tumour, as far as the openings extend, covered freely with the caustic vegetable alkali. The caustic gives some pain, but this soon subsides, and the severe burning pain, peculiar to the disease, is from that time entirely removed. Dr. Physick, to whom we are chiefly indebted for our knowledge of the proper application of this remedy, states, that "in all the cases in which he has used the caustic in this manner, the suffering of the patient ceased as soon as the pain from the caustic subsided." It should be recollected then, that the caustic will prove hurtful in the commencement of carbuncle; but extremely beneficial in the second stage, or at that period when openings form in the tumour. From inattention to these circumstances, there is reason to believe much mischief has resulted—from deep, ill-timed incisions, from the actual cautery, and from caustics, which have long been employed, at an improper period, especially by the French surgeons.

See Bromfield's *Chirurgical Cases and Observations*, vol. i. p. 118; Boyer's *Surgery*, vol. i. p. 241; Physick's *Case of Carbuncle*, with Remarks on the use of Caustic in that disease, in the *Philadelphia Journal of the Medical and Physical Sciences*, vol. ii. p. 172; Larrey's *Memoirs*, by Hall, vol. i. p. 51; Dupuytren *Clinique Chirurgicale*, tom. iv.; Carswell's *Illustrations of the Elementary Forms of Disease*.

* Dorsey's *Elements*, vol. i. p. 25.

SECTION IV.

PERNIO, OR CHILBLAIN.

THIS inflammatory affection is the result of cold, or of the sudden transition from cold to heat, and is commonly met with in extreme parts of the body, such as the toes, heels, fingers, ears, nose, and lips. At first the skin is pale and shrivelled; this state, however, is quickly succeeded by redness, tumefaction, more or less pain, pruritus and œdema. In bad cases the skin assumes a purple cast, the itching or tingling becomes intolerable, a serous fluid collects beneath the cuticle, and is soon discharged, leaving an ill-conditioned sore, which often penetrates to the bone, and is exceedingly difficult to heal.

The mild form of this complaint, or that unattended by ulceration, is by no means uncommon, especially in moist and temperate climates, where it often disappears spontaneously during summer, and regularly returns in winter, attacking for the most part patients who have previously suffered.

TREATMENT OF PERNIO.

Very common applications in the simple or mild form of chilblain, are ice water or snow; and there can be little doubt of their general utility, when used with moderation. To certain patients they are not adapted,—especially those inclined to phthisis or subject to the gout; nor are they suitable to delicate females. Spirituous embrocations often prove serviceable. Soap liniment, volatile liniment, spirit of turpentine, and tincture of cantharides are the best remedies of this class. I have frequently known the mild chilblain cured in a few days, simply by covering the part with carded cotton. An alum curd is sometimes a very effectual remedy.

For the ulcerated chilblain, some of the stimulating ointments, as the unguentum hydrargyri nitrati, or basilicon mixed with red precipitate, are often advantageously employed. Solutions of lunar caustic, or of the preparations of lead, or lime water mixed with linseed oil, are likewise useful. At first, these

remedies are scarcely felt by the patient; but in a little time the sore becomes exquisitely sensible, and should then be covered with poultices and mild dressings until completely healed.

According to *Lisfranc*, the chloride of lime is a very useful remedy in the ulcerated chilblain. In one obstinate case of the kind, this surgeon covered the affected part with perforated plasters of simple cerate. Pieces of lint dipped in a solution of the chloride of lime, were then applied and renewed every twenty-four hours, and soon effected a perfect cure.

See Pearson's Principles, p. 153; Thomson on Inflammation, 646; Rees' Cyclopedia, vol. viii. part i., the Art of Preserving the Feet, &c., by an experienced Chiropodist, p. 149, London, 1818; *Traité de Chirurgie*, par M. J. Chélius, Professeur de Chirurgie et de Clinique Chirurgicale à l'Université de Heidelberg; traduit de L. Allemand par J. B. Pigné, interne des hôpitaux civils de Paris, 1835.

SECTION V.

FROST-BITE.

INTENSE cold applied to the body, or to a part, may produce effects very different from those last mentioned. The vital functions may be entirely extinguished, or only suspended, or else some particular texture may be destroyed, through the medium of mortification. Although many instances are on record, of persons having died from exposure to severe cold, and of others recovering after the suspension of animation for a considerable time, yet such consequences are rare, compared with the partial injuries which result from *frost-bite* or mortification. Few cold seasons, indeed, pass away, especially on our sea-coast, without numerous instances of frost-bite taking place. The part to which the cold is applied first becomes benumbed, stiff and insensible. These symptoms are succeeded by heat, swelling, and more or less pain; the skin assumes a livid hue, and suppuration soon takes place between the sound and injured parts. If the sur-

geon be called in time, which is seldom the case, the warmth of the part, by proper treatment, may perhaps be restored, and mortification prevented. When the cold is long continued, and so intense as to affect the internal organs, the symptoms are drowsiness, shivering, rigidity of the limbs, diminution of the circulation, and finally profound sleep, which often terminates in death.

TREATMENT OF FROST-BITE.

Premature exposure of frost-bitten parts to heat, has frequently been attended with the worst consequences. Instead, therefore, of laying a patient in a warm room, or before a fire, cold applications, such as snow, or ice water, should at first be employed, taking care that very little force be exerted upon the frozen part, lest it be broken or otherwise injured by the friction. After the natural temperature has been restored, moderately stimulating embrocations, such as camphorated spirit of wine, will perhaps be found useful. But sometimes the inflammation is so active as to require cold solutions of the acetate of lead, and other similar applications. In most instances, however, there is a strong tendency to gangrene, and the most powerful stimulants will of course be required to arrest its progress. When mortification has once taken place, the remedies adapted to that particular state must instantly be employed. An oatmeal poultice mixed with stale beer, is among the best local applications that can be employed.

When the system is affected by cold to such an extent as to render the patient insensible, various means may be used to produce reaction. The chief indications are to excite the muscles of respiration and to restore the circulation. The former may often be accomplished by sternutatories and volatiles, and the latter by frictions with flannels, covered with stimulating materials, and applied to the whole surface, particularly to the epigastric region. This treatment should be continued, unremittingly, for a considerable time; for instances have occurred of recoveries, after the lapse of several days, and under the most unfavourable circumstances. Some writers recommend the immersion of the whole body in ice water; but the practice cannot prove otherwise than injurious, and should never be pursued. After the patient has been somewhat revived, by the means

pointed out, it will be proper to administer stimulants internally, such as brandy and water, or a little warm wine. Very often it will become necessary to keep up for some time the patient's strength. In such cases the internal use of the sulphate of quinine, or of musk and ammonia combined, will prove exceedingly beneficial.

See Kellie's Case of Torpor from Cold, in *Edinburgh Medical and Surgical Journal*, vol. i. p. 302; Thomson on Inflammation, p. 613; Larrey's *Memoirs* by Hall, vol. ii. p. 156.

SECTION VI.

BURNS.

BURNS are very common accidents, and produce, not unfrequently, immense injury, and even death. From the time of Hildanus to the present day, they have, commonly, been divided into three species. The particular arrangement of Pearson—the *superficial, ulcerated, and carbunculous* burn—appears to me the most satisfactory. In the *first*, the cuticle is injured, but does not separate from the cutis, until a new one is nearly formed. The pain and swelling are inconsiderable, and there is no vesication. In the *second*, the cutis is extensively injured, a serous effusion takes place, the cuticle separates and leaves behind a painful and suppurating sore. Constitutional symptoms, such as rigors, a quick small pulse, followed by a hot skin, furred tongue, and difficult respiration, are likewise common attendants. The *third* species, or the carbunculous or sloughing burn, is that in which the cutis and adjoining parts are disorganized, and converted into a hard eschar. The local and constitutional symptoms are extremely severe, and the shiverings, for several hours after the accident, almost incessant. The pulse is very feeble and quick, and the asthmatic symptoms are so urgent that the patient can scarcely breathe. If he re-

cover from the shock communicated to the system, the slough separates in a few days and leaves a very painful ulcer, which is soon covered with fungous granulations, and will always be found very difficult to heal. The symptoms, however, in all the three species of burns must necessarily vary very much, according to the degree of heat applied, the extent of the surface injured, the peculiar constitution of the patient, and a variety of other circumstances.

TREATMENT OF BURNS.

Two very opposite modes of treating burns have been in use from time immemorial—by *refrigerants* and *calefacients*; and it is not easy to determine which are the most beneficial. There can be little doubt, however, of the utility of both, provided they are judiciously employed.

In *superficial* burns, rags dipped in cold water, and constantly applied to the part, afford great relief. Still better effects result from pounded ice, mixed with hog's lard, or enclosed in bladders. Cold scraped potatoes or turnips are very commonly applied to a burnt part, and are found very soothing and agreeable. But the best application I have ever tried is *raw cotton*, thinly spread out or carded, and laid directly over the burn. The value of this remedy was ascertained, accidentally, a few years ago, by a lady living in Hartford county, Maryland, whose child was scalded by boiling water, nearly over its whole body. The mother was carding cotton in an adjoining room at the time of the accident, and having no medical assistance within reach, undressed the child as quickly as possible, and covered the whole burnt surface with masses of the cotton. The effect was wonderful; for the child soon became perfectly quiet, fell asleep, and upon removing the cotton, a few hours afterwards, no inflammation whatever could be perceived. Dr. Dallam,* to whom we are indebted for an account of this case, has furnished others of a similar character, in which the cotton proved equally efficacious; and my own experience enables me to confirm his statement of its usefulness. It is only, however, in the *superficial* burn that this remedy can be relied upon. A mode of treating burns some-

* See Dallam on the Use of Cotton in Burns, in Potter's Medical Lyceum, p. 22.

what analogous to that of Dallam, has been recommended by Velpeau of France—by compression. A roller is accurately applied to the injured part as soon as possible after the accident. “By the paper of Velpeau it appears that in a burn of the slightest or first degree, a compressing bandage prevents the development of inflammation: in the second degree it hinders the occurrence of blisters, or if not employed sufficiently early to do so, re-attaches the epidermis, and occasions the absorption of the effused serum. In the third degree it cannot prevent an eschar, but renders the accident less painful,” &c. *Vinegar* has been highly extolled, of late years, as an application for burns, by Mr. Cleghorn, a celebrated brewer at Edinburgh, whose workmen often suffered severely from such accidents. I have tried it in many cases of burns, but have never known it of service except in the first species. If used during the vesicated or ulcerated stage, the pain is intolerable.

The *ulcerated* burn requires a treatment very different from that of the superficial burn. Openings should first be made with a needle through the cuticle, to discharge the serum collected beneath; taking care, at the same time, not to tear the cuticle, or expose the raw surface of the cutis to the air, which always has the effect of creating considerable irritation. When ulceration takes place, the patient generally suffers severe pain, and emollient poultices will then be found to afford more relief than any other applications. These should be continued so long as they seem to agree with the sore. Powdered chalk, or lapis calaminaris, sprinkled over the whole surface of the burn, and occasionally renewed, are productive of the best effects. The linimentum ex aqua calcis, spread upon fine old linen, and kept constantly in contact with the ulcerated surface, I have often employed with great advantage.

The *calefacient*, or stimulating plan of treatment, is chiefly adapted to the carbunculous or sloughing species of burn. Remedies of this class are not only applied to the injured surface, but are often administered internally, on account of the shiverings, weak pulse, and other symptoms denoting severe constitutional derangement. Great care should be taken, however, lest such medicines be continued too long, or given in too great quantities; for it often happens, after the first effects of the burn subside, that violent reaction takes place, and can only be subdued by rigid attention to the antiphlogistic system. But in al-

most every stage of a burn, where the constitutional disturbance and pain are considerable, *opium* may be freely and beneficially resorted to. The stimulating articles, usually employed, *externally*, are spirit of wine, or spirit of turpentine, either alone or mixed with oils or ointments, and applied to the injured parts by a feather, brush, or by linen rags. In some cases they excite violent pain, especially when laid on the sound skin. Baron Larrey has condemned all the common modes of treating burns, and depends, chiefly, upon dressings composed of saffron ointment, spread on old linen, from which he states that he has derived the most salutary effects.

From carelessness on the part of the surgeon, it often happens, that fingers, toes, and other parts grow together, and produce unnatural contractions or extensions. Such accidents may always be prevented, by interposing lint, or plasters, between the burnt parts, and by using splints and bandages.

The mode of relieving these deformities is to cut across the adhesions at particular spots, and restore the parts to their former position; taking care to prevent reunion during the progress of the cure. The operation does not always succeed; although it has answered the purpose in most of the cases in which I have tried it. On account of its occasional failure, Mr. Henry Earle has proposed to remove the cicatrices altogether, and bring the edges of the sound skin towards each other, in a transverse direction, and there retain them by adhesive strips. In a few instances I have employed the plan successfully; but, in general, the operation is complicated and painful, and in the end not more beneficial than the common mode.

See Thomson on Inflammation, p. 585; Pearson's Principles of Surgery, p. 171; Earle on the Means of lessening the Effects of Fire on the Human Body; Kentish on Burns; Larrey's Memoirs, vol. i. p. 43; H. Earle, in Medico-Chirurgical Transactions, vol. v. p. 96; Dickenson on Burns and Scalds; Cases in which the Operation for the Removal of Cicatrices from the Neck consequent on Burns, was successfully performed, with Remarks, by Dr. H. James, Surgeon to the Devon and Exeter Hospital, in Medico-Chirurg. Transactions, vol. xiii. part i.; Dupuytren Leçons Orales, &c.

CHAPTER III.

WOUNDS.

WOUNDS may be divided into incised, punctured, penetrating, contused, lacerated, poisoned, and gun-shot. These admit of subdivision—as wounds of the head, face, neck, chest, belly and extremities. All such injuries will prove more or less dangerous according to their extent, the manner in which they are inflicted, the age and constitution of the patient, the situation and texture of the wounded part, the treatment that may be adopted, and a variety of other circumstances to be considered hereafter. In general, it may be stated, that wounds involving large blood-vessels, nerves, and joints, are more hazardous than others, that a very trivial wound in a bad constitution will sometimes give rise to most violent symptoms, and even death, and that, on the other hand, very extensive wounds often terminate in the most favourable manner.



SECTION I.

INCISED WOUNDS.

INCISED wounds are the most simple, and, independently of hemorrhage, the least dangerous of all. Profuse bleeding, however, is very apt to take place, even from vessels of moderate size,—provided the cutting instrument is exceedingly sharp. A wound produced by a dull instrument, on the contrary, seldom pours out much blood. As soon as any part is divided, there is a recession of its edges, owing either to the size of the instru-

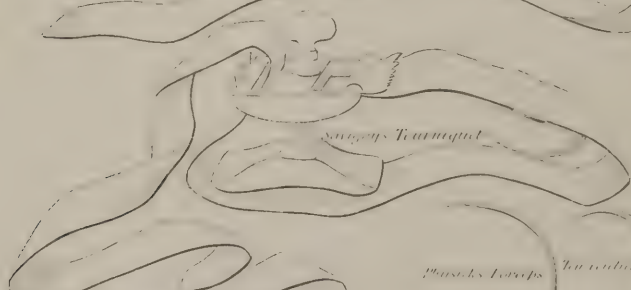
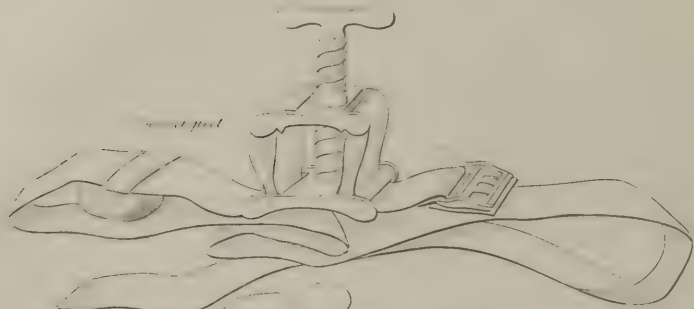
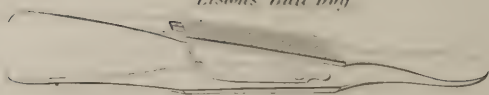
ment by which it is produced, or to the elasticity and contractility inherently possessed by most living textures.

TREATMENT OF INCISED WOUNDS.

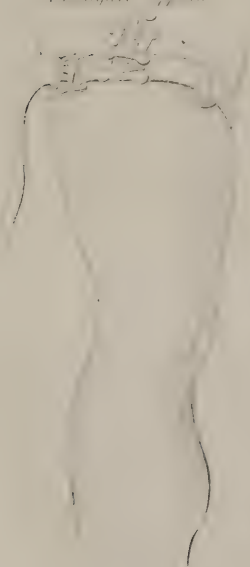
The chief indications, in the treatment of an incised wound, are to suppress the bleeding, and afterwards to retain the edges in contact, by such means as are best calculated to favour their reunion. The removal of foreign bodies is also, in many instances, an object of considerable importance.

Hemorrhage may be stopped either by ligature or by compression. The first is always the most effectual, and should be resorted to whenever the situation of the wound will admit of it. The *tenaculum*, *needle*, and *forceps*, are the instruments commonly employed for casting a ligature around the divided vessel. When the wound is open, not very deep, and the vessels large, the *tenaculum* will be found the most convenient. The point of the *tenaculum* should be moderately curved, and not very sharp, otherwise the surgeon will find it difficult to catch the mouth of the artery, and when caught the instrument is liable to cut itself out. After the bleeding vessel is drawn out, it may be tied by an assistant, or if no one be at hand, the surgeon will often succeed by holding the handle of the *tenaculum* between his teeth, and using his own hands for drawing the ligature. Upon such occasions, a *tenaculum* with a leaden handle, sufficiently heavy to drag out the vessel when suspended from it, will prove very useful. The *artery forceps*, which should always be serrated at the extremities and have a moveable slide to close the blades, will answer nearly the same purpose as a *tenaculum*. Within the last few years, an excellent artery forceps has been contrived by Mr. Liston, which has three sharp teeth, accurately fitted to each other, and capable of taking a very secure hold by pressure on a spring fixed to the blades, and as easily disengaged when required. It is superior to Assalini's instrument. The *needle* is now seldom used for securing bleeding vessels, because it is necessary to include with it more or less of the surrounding soft parts, and in so doing important nerves may be tied, or vessels of considerable size opened, from both of which much mischief will result. For taking up deep-seated arteries, beyond the reach of a *tenaculum* or common needle, Dr. Physick has em-

Liston's Bull Dog



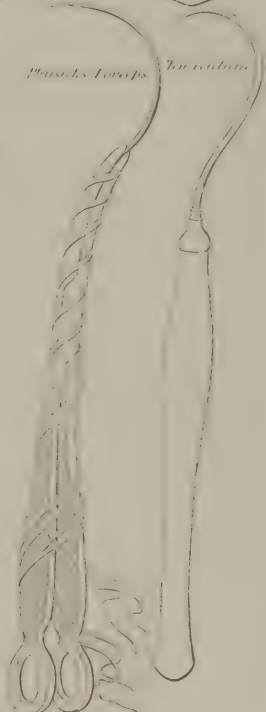
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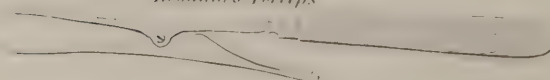
Libby's Forceps



Penick's Forceps



Assahni's Forceps



ployed, ever since the year 1800, a *forceps*, so constructed as to hold in its extremities a needle armed with a ligature. The handles of the forceps are fastened together, temporarily, by a string or catch, and when the needle is fairly deposited beneath the vessel, it is disengaged from the forceps and drawn out, leaving the ligature behind, which can be tied without difficulty.”* (See Plate I.)

Ligatures are commonly made of thread, silk, or leather. All may occasionally be used with advantage, provided they are of proper shape or size. Round ligatures are superior to the flat or irregularly twisted, inasmuch as they divide the internal and middle coats of the vessel with uniformity. The use of the leather or *animal* ligature was first suggested by Dr. Physick,† in the year 1806; but no account of it was published until 1816.

The best material for animal ligatures is *French kid leather*, cut into strips, from a quarter to half an inch in breadth, (the grain or polished surface being previously peeled off,) well soaked in water and then stretched and rounded. *Buckskin* and parchment, treated in the same manner, make very good ligatures. *Catgut* and tendon of the deer, although recommended by some surgeons for the same purpose, I have never found suitable. The advantage possessed by the animal, over ordinary ligatures, is its speedy decomposition, and separation from the artery, whereby the patient is saved much unnecessary irritation and pain. The *lead*en ligature was first suggested and employed by Dr. Physick. Latterly the attention of the profession has been called to it by Dr. Macartney of Dublin. For several years past I have practised the plan first recommended by Veitch—of cutting off one end of every ligature and leaving the other hanging from the wound, in order to diminish irritation, and have good reason to be pleased with the result. I have also tried, upon several occasions, the method, (mentioned it is said as early as the year 1786, by Mr. Haire‡ of England,) of cutting off both ends of the ligature close to the knot, and then healing the wound over them—but generally without any manifest advantage. The

* Dr. Physick's forceps is a modification of the *acutenaculum* or *port-aguille*, an instrument used by the older surgeons for *sewing wounds*. Richerand recommends a needle mounted upon a handle for taking up deep-seated arteries. See *Nosographic Chirurgicale*, tom. iv. p. 37, edit. 4th.

† See *Eclectic Repertory*, vol. vi. p. 389.

‡ See Hennen's *Principles of Military Surgery*, p. 181, 2d edition.

fact that a ligature divides the internal and middle coats of an artery, leaving the external coat entire, was first pointed out by Desault.

Compression may be accomplished either by the *tourniquet*, or by *rollers* and *pledgets*. The *tourniquet* (Plate I.,) is chiefly adapted to wounds of the extremities. When the regular instrument is not at hand, a very convenient one may instantly be made, by tying together the ends of a common handkerchief, throwing the circle around the limb, and twisting with a stick until the necessary degree of pressure is effected. The roller and compress may often be used with advantage, when the bleeding vessel is superficial and supported by a bone, as in the wrist and temple. *Agaric* and *sponge*, formerly much used for arresting hemorrhage, are now seldom employed. Under particular circumstances, however, the sponge will prove very serviceable, especially in hemorrhage from deep cavities. *Styptics*, of which the older surgeons were very fond, are scarcely ever thought of, and the *actual cautery*, anciently resorted to upon the most trivial occasions, is nearly banished from practice.

Pieces of glass, and other foreign bodies, are occasionally lodged in incised wounds. They should always be carefully picked away; for if left behind, great irritation will be excited. Sometimes bits of glass are working out for months or years after the wound has healed, and frequently are never found. The wound should always be kept open, and covered with an emollient poultice, when there is reason to suspect the lodgement of such articles. Blood, interposed between the edges of an incised wound, may act as an extraneous substance, and on this account ought to be removed before they are brought together.

Adhesive plasters are preferable to all other means for retaining in contact the lips of a wound. The parts to which they are applied should be perfectly free from moisture, and if covered by hair, closely shaved. It is difficult, in many instances, to obtain plaster sufficiently adhesive to prevent the edges of the wound from gaping. The material chiefly resorted to by druggists, is a mixture of lead plaster and resin, in the proportion of a pound of the former to two ounces of the latter. This composition should be melted and thinly spread on new linen, which must then be cut into strips of a length and breadth adapted to the extent and situation of the wound. Spaces should be left between the different strips for the escape of matter;—otherwise

abscesses are liable to form.* Adhesive straps may be assisted very much in some cases by bandages, particularly by the *uniting bandage*, which is merely a double-headed roller, with a slit in its centre, sufficiently large to admit one head of the roller to pass through, so as to form a loop well calculated to grasp a limb and afford great support. Previously to the application of plasters and bandages, it is of great consequence to place the wounded part in a *proper position*.

Sutures are, at the present day, only used when the wound is so extensive, or so situated, as not to admit of the application of adhesive straps. There are only two sutures in common use—the *twisted* and *interrupted*. The twisted is made by passing a silver pin about two inches long, armed with a moveable steel point, or a common sewing needle fixed in a temporary handle, through both edges of the wound, and then casting a ligature obliquely from one end of the pin or needle to the other in the form of the figure 8. This suture is well adapted to wounds of the face, lips, &c. To make the interrupted suture, two crooked needles, one at each end of a ligature, are necessary. The needles are entered on the inner sides of the wound and brought outwards, carrying with them the ligature, which is tied directly across the wound. In extensive wounds, a number of these stitches will be required, and should be placed at moderate distances from each other. Neither the interrupted nor twisted suture should ever be made in an inflamed part, if possible to avoid it.

The object of adhesive straps, bandages, and sutures, is to procure adhesion, or *union by the first intention*, as it has been denominated. This very important process was well understood by some of the older surgeons, particularly by Taliacotius of Bologna, who succeeded, by means of it, in restoring mutilated parts, and to a surprising extent. Mr. Hunter restricted the term union by the first intention, to that state in which the divided parts are held together, temporarily, by interposition of blood. By most surgeons, no distinction is drawn between it and the adhesive inflammation. The French surgeons are, for the most part, extremely averse to the practice of closing wounds,

* Messrs. Griffith and Ellis, druggists of this city, have for many years past furnished the profession throughout the United States with very superior adhesive plaster, which, when put up in tin cases, will retain its properties for years.

after injuries or operations, for the purpose of procuring a speedy adhesion. They believe that secondary hemorrhage and abscesses not unfrequently result, and give rise to very troublesome consequences. Such apprehensions, however, are extremely unfounded in the generality of cases, although it is certain that much mischief has occasionally arisen, especially after amputation, owing to the edges of the wound having completely healed, while the deeper parts suppurated. On this account, Dr. Physick has for many years been in the habit, in all amputations, of placing a bit of lint between the divided skin, to prevent immediate reunion. Besides these instances, cases undoubtedly occur in which it would be improper always to bring about direct adhesion—as in certain morbid or cancerous parts. On the other hand, by pursuing an opposite practice and procuring a speedy reunion, immense advantages are gained in the greater number of cases. Not only indeed has the adhesive process been applied to the restoration of parts partially separated, but several very successful attempts have been made to restore fingers, toes, and other portions of the body, that have been *entirely severed*. These attempts have been founded upon the well known experiments of Duhamel, Hunter, and others, of transplanting teeth, and of fixing the spur of a cock into the comb of another, so as to establish between them a complete inosculation and identity. An account of some very interesting cases of fingers restored, after being lopped off and remaining separated for some time, will be found in the tenth volume of the Edinburgh Medical and Surgical Journal. These cases are drawn up by Mr. Balfour, a respectable surgeon, and are well attested by other practitioners. The result should, at any rate, have the effect of inducing surgeons always to attempt reunion under similar circumstances, whether the process succeed or not, instead of cutting away, as too frequently happens, parts which are hanging by a small portion, under the impression that restoration would be impossible.

Dieffenbach, Graefe, Liston, and others of Europe, and the younger Warren in the United States, have revived many of the operations of Taliacotius, and invented new modes of restoring mutilated parts, with a success that reflects honour upon themselves and their respective countries. It must be confessed, however, that in numerous instances, these operations in the hands of others have signally failed, and have been productive

of greater deformity than existed originally. Nevertheless the cases have been trumpeted forth as successful even before the ligatures have come away or the wounds have healed. *New noses*, as they are called, built upon syphilitic or scrofulous foundations, are not only stinking and disgusting objects, but are very apt, in a short time, to crumble and fall away and leave their owners with large ulcerations, and worse off than before.

See Hunter on Inflammation, article Union by the First Intention, p. 189; J. Bell's Discourses on the Nature and Cure of Wounds; also, Principles of Surgery; Thomson on Inflammation, article Adhesion, p. 206; Carpue's Account of two successful Operations, for restoring a lost Nose from the Integuments of the Forehead; Balfour's Observations on Adhesion, &c.; Jones on Hemorrhage, article Ligature, p. 125 and 166; Lawrence on a New Method of Tying Arteries, &c., in Medico-Chirurgical Transactions, vol. vi. p. 156; Veitch's Observations on Secondary Hemorrhage, and on the Ligature of Arteries after Amputation and other operations, in the Edinburgh Medical and Surgical Journal, vol. ii. p. 176; Dieffenbach, Chirurg. Erfahrunen, 1830, Berlin; Velpeau, Med. Operatoire; C. F. Graefe, de Rhinoplastice, Berlin, 1818; Warren, in New England Medical and Surgical Journal.

SECTION II.

PUNCTURED WOUNDS.

PUNCTURED wounds are created by sharp and narrow instruments, such as needles, pins, thorns, splinters of wood, nails, &c. When slight, they are seldom attended with inconvenience or danger. Much, however, will depend upon the situation of the part wounded, and the constitution of the patient. An apparently trifling puncture among tendons, nerves, and fasciæ, has sometimes caused *tetanus*. Again,—large *collections of matter*, have formed under the fasciæ, producing great distress, and finally permanent contraction or extension of the limbs, by uniting the muscles or their connecting cellular membrane together. Many years ago I attended a young gentleman from the eastern shore of Maryland, whose forearm was covered with sinuses, from which matter could be pressed in every di-

rection. The fingers were crooked and useless. The disease arose from a very trivial wound made by a needle fixed in the end of an arrow.

The *lymphatics* often swell from punctured wounds. A wound of the foot will frequently cause a swelling of the groin, in every respect resembling the venereal bubo. Punctures of the fingers also, accidents very common in the dissecting-room, give rise to similar swellings of the arm-pit. Several anatomists and students have from this cause lost their lives. A red line may, generally, be traced over the tract of the lymphatic, from the wound to the enlarged glands.

Needles are sometimes buried under the integuments, or deep in the substance of the muscles. They are seldom productive of ill consequences, and in the course of time work out by approaching the surface. However, I once attended an old gentleman, who died from a needle which penetrated the great toe immediately under the nail. A case is related by Mr. Carmichael in which amputation near the shoulder joint was necessary, in consequence of several needles being imbedded in the pronator quadratus muscle, in the periosteum of the radius and ulna and between these bones.*

TREATMENT OF PUNCTURED WOUNDS.

In a common punctured wound it is seldom necessary to do more than apply a soft poultice to the part for a few days, when the wound will heal without difficulty. But when the part swells, and evident indications of the formation of matter exist, an incision should be made to prevent its extension, and the orifice kept open by a tent or bougie. If nervous symptoms arise, denoting the approach of tetanus, the wound should be freely dilated, and stimulating substances immediately introduced. Opium also must be exhibited in large and repeated doses. Hemorrhage is seldom the consequence of a punctured wound, even if a large artery be pricked—the opening being too small for any quantity of blood to flow. When needles, or similar substances are buried under the integuments, it is almost impossible to find them. But they should be searched for, immediately after they are introduced, and before they change

* Dublin Medical Transactions, vol. ii. p. 37.

their position. In some cases they may be readily drawn out by a forceps, and in others may be forced through the skin, by folding up the integuments or muscles around, and pressing opposite each extremity of the needle.

See Wardrop's Case of Nervous Symptoms from a Punctured Wound in vol. vii. of *Medico-Chirurgical Transactions*, p. 246; also a similar case, in vol. iv., by Dr. Denmark.

SECTION III.

PENETRATING WOUNDS.

THESE wounds are more extensive than punctures, and are generally produced by the small sword, bayonet, or dirk. They may prove dangerous, by entering large cavities, and injuring important blood-vessels, nerves, or viscera; or they may give rise to extensive collections of matter, among the cellular membrane and muscles, or under aponeurotic expansions. All penetrating wounds partake, more or less, of the nature of contused and lacerated wounds—the parts through which they pass being forcibly rent asunder, instead of being separated by a sharp-edged instrument. To this circumstance Richerand attributes the nervous agitation and other ill effects which occasionally result from such wounds.

TREATMENT OF PENETRATING WOUNDS.

The first object, in the treatment of penetrating wounds, is to suppress hemorrhage. This will be often found very difficult, owing to the depth of the wounded vessel, and the narrowness of the passage leading to it. Sometimes, also, the source from which the blood flows cannot be ascertained. Again,—the vessel may be situated between bones, under fasciæ, or among tendons, and cannot be reached without an extensive

and painful dissection. Under such circumstances, we should cut down upon the main artery of a limb, or upon the chief vessel in the neighbourhood of the wound, from which the bleeding derives its source, and secure it by ligature.* In some situations pressure may be found very serviceable—as upon the radial artery, in case of wound of the palmar arch, or upon the tibial arteries in wounds of the foot. The plan recommended by Dr. Dorsey should be preferred to any other.† When the wounded vessels are so deeply seated, as in the chest or abdomen, that they cannot be reached, our only resource is to diminish the activity of the circulation by general blood-letting, thereby diverting the stream of blood from the wounded part, and preventing its further effusion.

After inflammation has taken place, severe constitutional and local symptoms may arise. These are owing, not to the partial division of nerves and tendons, as the older surgeons supposed, but to the inflamed muscle being confined by a strong and dense fascia, or to inflammation of the fascia itself. These effects are most common after penetrating wounds of the thigh, hip, leg, forearm, bend of the arm, fingers, temple and head, where the fasciæ are numerous, firm, and unyielding. The true practice, in all such cases, is to dilate the wound, expose the fascia, divide it freely in a transverse direction, and the urgent symptoms will cease almost immediately. The wound may then be covered with a warm poultice, and in a few hours the thin ichorous discharge which is usually poured out while the nervous symptoms last, will be converted into a thick yellow, healthy pus. In simple penetrating wounds, unaccompanied by profuse hemorrhage, high inflammation, or constitutional disturbance, there can be no

* The operation, however, seldom succeeds, owing to collateral circulation.

† “I shall mention a plan which I have known successful in stopping the flow of blood from an artery in the foot. The patient was a child in whom several unavailing attempts to tie up the divided vessel had been previously made, and the wound was in a state of great inflammation. A compress was applied over the trunk of the anterior, and another over that of the posterior tibial arteries; about two inches above the ankle: over these a strip of sheet copper was passed round the leg, and a tourniquet was applied over the copper; in this way, when the tourniquet was tightened the tibial arteries were compressed and the bleeding ceased, the copper prevented the tourniquet from compressing any other vessel, so that the circulation in the foot was not interrupted. Probably in some analogous cases similar measures may be found successful.”—*Elements of Surgery*, vol. i. p. 57.

necessity for dilatation. The antiphlogistic regimen, and mild superficial dressings, will answer every purpose. Indeed, in many instances, such wounds heal by the first intention.

See Charles Bell's *Operative Surgery founded on the Basis of Anatomy*, vol. i. p. 7.

SECTION IV.

CONTUSED WOUNDS.

IN every contusion more or less injury is sustained by the deeper seated parts, even although the skin remain entire. In general, the smaller vessels are ruptured, and blood is poured into the cellular texture or among the muscles, producing an ecchymosis and discoloration. If considerable vessels be torn, a large circumscribed tumour may form, or else the surrounding parts may be extensively injected with blood, giving rise to gangrene from pressure, or to suppuration from irritation. The nerves, also, in contused wounds suffer materially from concussion—the effect being similar to that, although in a less degree, which takes place in injuries of the head. Hence, such wounds are at first attended with little pain, but their sensibility afterwards increases in proportion to the extent of the inflammation. A blunt instrument will operate according to the velocity with which it is carried, or to the resistance afforded by the texture upon which it is applied. For a blow to produce its full effect, the action and reaction should be equal. Where the parts yield, the shock is diminished, and the injury is less considerable. Oftentimes it happens that a limb is crushed by machinery, the bones are mashed into small pieces, the joints destroyed, and the vessels bruised or torn, and yet the skin, from its yielding nature, is not divided. An injury of this description is dangerous in the extreme, and gangrene the almost certain consequence. When the skin is cut along with the internal parts, it is generally owing to the surface of the contusing weapon being not very broad.

TREATMENT OF CONTUSED WOUNDS.

A simple bruise or contusion, should be treated upon common antiphlogistic principles. *Leeches* applied to the part will be found extremely serviceable in subduing the swelling and pain. Cloths dipped in a cold solution of the *acetate of lead*, and constantly applied, will also prove very useful. Perfect rest and relaxation of the muscles are essential.

After the inflammation has subsided, repeated friction with stimulating embrocations, such as the *soap* and *volatile liniments*, by promoting the absorption of the effused coagulated blood, will soon effect a cure. When the extravasation of blood has been too considerable to be taken up by the absorbents, an *opening* should be made in order to evacuate it. In slight cases, however, such an operation should always be avoided. A *roller* applied with moderate firmness will often assist materially in dissipating the swelling, and in preventing œdema, which is always apt to ensue.

Although there is seldom much prospect of uniting a contused wound by the first intention, it should always be attempted, inasmuch as even partial agglutination will serve to keep the edges together, and prevent deformity and other ill consequences. But great care must be taken not to approximate the sides of the wound too closely, by rollers, adhesive straps, or sutures, lest so much pressure and irritation be produced as to bring on gangrene. *Stitches* indeed should in most contused wounds, be prohibited. When along with the contusion there has been loss of substance, and the edges of the wound cannot be brought together, a poultice moderately warm, and occasionally repeated for a few days, will keep the part easy and promote granulation. Afterwards, simple dressings may be employed. As there is always more or less concussion in every extensive contused wound, blood-letting and other general depleting remedies should be avoided until reaction is completely established. Should symptomatic fever follow with high local inflammation, the patient must be bled freely, take purgatives, and be kept on a low diet.

SECTION V.

LACERATED WOUNDS.

ANY obtuse or irregular body, driven with force, may produce a lacerated wound. Machinery in full motion, a cannon-ball, splinters of wood, are apt to create very extensive and ragged lacerations. Sometimes a patient falls from a height, and lights amidst sharp and disjointed stones, by which the soft parts are torn and shockingly mangled, and dirt kneaded into them in such a way as to render it almost impossible to wash them clean. In other instances, the scalp is suddenly whirled off by the wheel of a cart or carriage passing over the head. Again—whole limbs are torn from the body by being entangled in machinery. Many such cases are recorded by different surgical writers, especially by Chesselden, Carmichael, La Motte and Morand. Lately, an interesting case has been detailed by Dr. Kennedy, of India, where a dreadful lacerated wound took place from the bite of a shark. The abdominal muscles were cut asunder and turned back, so as to expose the colon and several convolutions of the small intestines; three of the lowest ribs were laid bare, the gluteal muscles torn up, the tendons about the trochanter divided, and the vastus externus and rectus muscles completely separated. A more extensive and shocking wound could hardly be produced, and yet the patient in a few weeks recovered.

Every lacerated wound is peculiar in this—it bleeds sparingly. However large or numerous the vessels torn—however extensive or complicated the injury, it will be found universally that the hemorrhage is comparatively inconsiderable. Some years ago, I was called to visit a patient at Dorsey's iron works in Maryland, whose right arm above the elbow had been torn off in a mill. Seven or eight hours elapsed before I reached him, and although the arm had been dreadfully mutilated, the muscles torn to tatters, and the brachial artery was gaping with open mouth on the surface of the stump, yet not more than a few spoonsful of blood were lost. So extensive, indeed, had been the shock, and so far had its influence extended, that, in amputating the arm several inches above the torn extremity, hardly any blood was poured out, even when the main artery was cut through in a part apparently sound, and which afterwards healed

with great facility. In another instance, a boy, in falling from the top of a tree, had the brachial artery, at the bend of the arm, torn completely across by a projecting branch. Scarcely a drop of blood was lost, and in searching for the vessel, some hours after, it could hardly be made to bleed, although repeatedly cut with a view of ascertaining the extent of the injury.

The indisposition manifested by a lacerated part to bleed, is owing to the injuries sustained by the nerves, not only in the immediate vicinity of the wound, but to a greater extent around than the eye can discover. Hence the arteries are paralyzed, and do not contract to propel the blood, which coagulates in their cavities, or among the torn muscular fibres. Hence, also, all lacerated wounds are attended with little pain, are liable to gangrene and to secondary hemorrhage, which is then more dangerous than bleeding produced by sharp cutting instruments.

TREATMENT OF LACERATED WOUNDS.

In every lacerated wound the attention of the surgeon should be directed first towards the removal of extraneous bodies, and the suppression of hemorrhage, if any exist. The edges of the wound should be next loosely drawn together, and retained by adhesive straps. Although we can scarcely calculate upon adhesion to any extent, after such injuries, yet great benefit results from keeping the parts as nearly as possible in their natural situation, inasmuch as fewer granulations will afterwards be required to supply any loss of substance, than if the parts were permitted to recede from each other. Adhesion, however, does in some cases take place to a much greater extent than we could imagine possible, and that, too, after very severe and extensive lacerations. We should make it a rule, therefore, never to remove any loose hanging portion, under the idea that it must necessarily slough or separate, since this can only be determined by the event of the case. At any rate no harm will result from permitting the wounded parts to remain, even if they be in a gangrenous state, as they must soon separate spontaneously. If much swelling and pain arise after the lips of the wound are approximated, the straps should be removed, and the whole surface of the wound covered with a warm poultice, which should be repeated frequently and continued until suppuration is fully established, when the edges may again be drawn together, and generally

with decided benefit. After the sloughs have separated and the surface of the wound becomes clean and granulating, simple dressings may be employed.

Very severe constitutional symptoms—as fever, restlessness, and delirium, sometimes follow lacerated wounds. These must be subdued by blood-letting, saline purgatives, and low diet. But care should be taken not to carry depletion too far or to detract suddenly a large portion of blood, otherwise gangrene, to which at any rate there is generally a predisposition, may be hurried on. Tetanus, moreover, which is very apt to ensue, from lacerated wounds, will more readily be induced, if the system has been much prostrated by evacuants. When there is no prospect of healing a lacerated wound, but on the contrary when gangrene is inevitable, then amputation, if the part admit of it, must be resorted to. The surgeon, however, should possess much judgment, to enable him to determine the precise period when the operation should be performed. In particular, he should carefully avoid amputation, so long as the extremities are cold, the pulse weak and fluttering, the wound dry, and the powers of life nearly exhausted. From inattention to these circumstances, I have known four patients lose their lives, who, under judicious treatment, might probably have been saved.

But there is another extreme into which the surgeon may fall, if not strictly on his guard—the removal of the limb after the circulation has been restored, after fever has commenced and the wound become painful and begun to discharge a bloody serum. A medium should then be chosen, and the moment selected for operation when the powers of life have returned, when the lips have regained their colour, the features their natural appearance, and the extremities a proper warmth.

When patients die from a premature operation, it is owing to the shock communicated to the nervous system, before the vital energy has rallied sufficiently to encounter so severe a stimulus. When they die, after the full restoration of the circulating system and the establishment of febrile action, then life is assaulted through the medium of inflammation and high action, and the operation is almost sure to be followed by gangrene. Each state then, it will be seen, is precarious, and it is only by observing a happy medium that we can expect to succeed. Tetanus in some instances follows very speedily a lacerated wound. In hopes of arresting its progress, some surgeons have

advised immediate amputation. I have known the remedy tried in one instance only, but the patient died before the operation was completed. *Immense* doses of opium and asafœtida I believe to be the only alternative under such circumstances.

See in Pott's Works, vol. i. p. 9, a note by Sir James Earle; Chesselden's Anatomy, Case of James Wood; Carmichael, in Medical Commentaries, vol. v.; Morand, in Academie de Chirurgie, tom. iv. p. 141; La Motte, *Traité des Accouchemens*; Kennedy, in Medico-Chirurgical Transactions, vol. ix. p. 240.

SECTION VI.

POISONED WOUNDS.

POISONED wounds occur frequently, and are dangerous or otherwise, according to their extent, and the agent by which they are produced. Whether these agents be derived from the animal, vegetable, or mineral kingdoms, they are in many instances equally deleterious. In this country such injuries generally arise from insects, serpents, rabid animals, or from the introduction of morbid matter into the system.

Among the insect class, wounds from the common bee, humble-bee, wasp,* hornet, yellow-jacket, are very frequent, and

* "Mrs. Day, aged 60, wife of Colonel Day, of Deerfield, Portage county, died in fifteen minutes after receiving the sting of a yellow wasp whilst engaged in drying apples."

"As Mr. Martin Lazarus, of Salisbury township, Lehigh county, was employed in hauling manure, in a three horse wagon, a bee happened to light on the leader horse whilst passing the garden fence, and stung him. This started not only the leader, but also frightened the other two horses, and endeavouring to stop them, the wagon got in contact with the garden fence, tore it away, and upset a whole row of hives. The enraged bees all fell upon the horses and men, and stung two of the horses to death, and very much injured the other, as well as Mr. Lazarus, his son, and servant."

"Mr. Edwards of Peckham, placed a pony about fifty yards from a bee hive, and quite out of sight thereof. The bees alighted on the pony, and stung her so violently, that she died in about fifteen hours after. The pony was bled and washed with stone blue water and dissected: the kidneys appeared much bruised. It is supposed, from the agony she appeared in, that it was as much from the effects of fright as of pain that she died."

sometimes productive of high inflammation and pain. Instances, indeed, are recorded of death, both in human subjects and inferior animals, from the attacks of swarms of these animals. Occasionally death has followed from swallowing a wasp or bee, in consequence of the gullet being wounded by the sting of the animal while passing to the stomach. In this way a young woman in Jersey, a few years ago, lost her life—a bee having been enclosed in a piece of honey-comb which she swallowed.

The mischief resulting from the stings of bees, wasps, &c., does not proceed from the mechanical injury, but from the acrid liquor infused into the wound by these animals; each of which has a subtle poison contained in a receptacle, situated within the abdomen among the air-vessels, and is furnished with muscles and other apparatus for injecting the wound made by the barbed dart or sting. In the hornet and yellow-jacket this liquor is highly acrimonious, and quickly excites very violent inflammation.

Besides insects of the bee kind, there are several others which occasionally inflict severe and dangerous wounds—the common musquito, some varieties of fly, certain spiders, the scorpion, &c. In peculiar constitutions the musquito bite will degenerate into a very troublesome sore, and death has even followed. Dr. Dorsey* states, that he once knew gangrene and death to take place from the bite of this insect, in the case of a lady who previously enjoyed very good health. I am informed by a distinguished naturalist of this city, that numerous instances have occurred at Egg Harbour and other places similarly situated, of cattle being destroyed by the wounds received from these animals. The bite of the green-headed fly, common about Cape May and other parts of the Atlantic coast, is extremely severe; but I have never heard of serious injury from it.

The spider has long been considered a venomous insect. There is reason to believe, however, that most of the species are harmless, whilst it is certain that in a few instances, very severe symptoms and even death have followed from the bites of particular animals of the class. Dr. Mease† mentions an instance of a person who lost his life, from an apparently insignificant wound of one of these insects. The bite of the tarantula, a species of spider common about Naples and many other parts of Europe, was formerly supposed to be extremely venomous and

* Elements of Surgery, vol. i. p. 68.

† Domestic Encyclopædia.

often fatal. Modern observations, however, prove that few ill consequences result from wounds inflicted by these animals. It is very surprising that such men as Geoffroy,* Baglivi,† and Mead,‡ should not only give credit to the fanciful and ridiculous reports of the supposed operation of the poison of the tarantula, but should even endeavour to account for its specific mode of action, and for the imaginary effects of music in promoting its cure. During the expedition up the Missouri under the command of Major Long, Mr. Say and the other naturalists often met with a spider of monstrous size and very hideous appearance; but no opportunities were offered of ascertaining whether it was venomous. M. Morau de Jonnes has furnished a memoir on an enormous spider common at Martinique and its vicinity, which attacks small birds and reptiles, and infuses into the wounds made by its strong jaws a subtle poison, which quickly proves fatal.§

The scorpion is a very venomous insect, and often in warm climates inflicts a fatal wound. The largest of the species, (*scorpio afer*,) inhabit India, Persia and Africa, and are much dreaded on account of the activity of their poison, which is contained in a reservoir situated near the tail of the animal, and ejected from two small holes on each side of the tip of the sting. The American scorpion is not so large as some other species, but is capable of producing by its sting most violent inflammation and sometimes death. From a number of experiments performed on dogs and other animals by Maupertuis,|| it appeared that the sting of the scorpion caused the whole body of the wounded animal to swell, and was productive of violent retching convulsions and death. In other instances no inconvenience whatever followed from the sting of these insects. "I have frequently seen," says Mr. Allan, "the sting of the scorpion followed by violent inflammation and swelling, similar to those of bees and wasps, only in a more aggravated degree. In the years 1803 and 1804, I had many opportunities of witnessing wounds inflicted by the sting of the scorpion on board of *La Dianne* frigate. She was one of those French ships which escaped from the battle of the Nile,

* Royal Academy of Sciences, 1702.

† Baglivi, Opera.

‡ Mead on Poisons.

§ For an account of the medical properties and bite of the spider, see Lister, *De Araneis Tractatus*, also Berner, *De Araniæ punctura et ejus medela*.

|| Mem. de l'Academie des Sciences, 1731.

but was afterwards captured by the British when coming out of Toulon. In August, 1803, she was commissioned at Plymouth, and taken into the service of the British Navy. Having been long in the Mediterranean while in the French service, the scorpion had got on board. From the coldness of our climate the insect had lost its vigour, and lay concealed behind the lining, in the seams, betwixt the timbers, and in other parts of the ship; but no sooner had the ship gone to sea, and proceeded to the southward, than it was found she was literally swarming; the heat renewed their activity: they crawled forth from their lurking holes and stung many of the men. The wound was always followed by violent and extensive inflammation, considerable swelling, and great pain, but I never observed any violent constitutional symptoms succeed to the local.”*

Of the numerous American serpents two species only are known to be venomous—the *rattlesnake* and *copperhead*. Eight varieties of the former have been familiar to naturalists, and two others have been discovered lately by Humboldt† and Bonpland. All are poisonous, but in particular the *crotalus durissus*, *horridus*, and *miliaris*. The copperhead, (*boa crotaloides*,) sometimes called the bastard rattlesnake, is also exceedingly malignant. All these reptiles are furnished with long teeth, or poisonous fangs, the roots of which are surrounded by a bag or reservoir containing an active or virulent poison. This poison is discharged into the wound through a small fissure of the tooth situated near its extremity, and in many instances very quickly proves fatal both to man and to inferior animals. As regards the effect of the poison, much will depend upon the size of the animal bitten—death being produced more readily in the smaller than in the larger animals. According to the experiments of Vosmaer, sparrows, finches and other small birds died in about four minutes, while a mouse died in a minute and a half. The deleterious operation of the poison will also depend materially upon its quantity, and upon the season of the year at which the wound is inflicted. To ascertain the effect of the bite of the rattlesnake, several experiments were made by Captain Hall of Carolina, upon dogs, cats, chickens and frogs. Three dogs were bitten in succession by a snake four feet long. The first died in less than a quarter

* Allan's System of Pathological and Operative Surgery, vol. i. p. 370.

† These are the *Crotalus Cumanensis* and the *Crotalus Lasingii*. See *Recueil d'Observations de Zoologie et Anatomie Comparée*, 4to.

of a minute, the second in two hours, and the third in three hours. Four days after two other dogs were bitten; one of which died in half a minute, the other in four minutes. Several experiments, nearly similar, were made by the late Professor Barton on chickens. Of three chickens bitten on three days successively, one died in a few hours, another lived much longer, and the third recovered, after having been exceedingly swelled. On the fourth day, several other chickens were bitten, but recovered without a bad symptom.

The rattlesnake is more lively, and its venom more active, during very warm weather than at any other period: upon the approach of cold seasons it becomes languid, and then strikes reluctantly, and frequently without any ill consequence. The effects produced by the poison either on the human body or on the lower animals, vary according to the parts wounded, the depth to which the fang penetrates, and the quantity and strength of the venom in the reservoir. In many instances death follows in a few seconds or minutes, and in others not until many days or weeks. The interesting case detailed by Sir Everard Home, which I witnessed whilst a student in London, furnishes striking proof of the speedy operation of the poison of the rattlesnake, and at the same time affords incontestable evidence that it may remain a long time in the system before death is produced. The patient was teasing a large rattlesnake with the end of a foot rule, but could not induce the animal to strike; the rule accidentally dropping from his hand, he opened the door of the cage to take it out; the snake immediately darted at the hand, and inflicted four wounds—two on the back part of the first phalanx of the thumb, and two on the side of the second joint of the forefinger. The hand soon after began to swell, and in the course of ten or eleven hours the whole arm, axilla and shoulder were very much tumefied, and cold. There was an unusual coldness also throughout the skin of the whole body. At this period the mind of the patient was perfectly collected; but immediately after the accident he talked incoherently, owing probably to strong drink, which it was ascertained he had taken before he was bitten. From the axilla the swelling extended down the side, and blood was extravasated under the skin as far as the loins, giving the back a mottled appearance. The skin over the whole body became warm, faintings occurred repeatedly, vesications appeared in different parts of the body, a large abscess formed on the outside of the elbow, and discharged half a pint of reddish mat-

ter; mortification took place in the axilla, in the forefinger, and some other parts, and finally destroyed the patient, after he had laboured for eighteen days under the most distressing symptoms. Upon dissection, the body presented a natural appearance, (with the exception of the arm that had been bitten,) and the wounds made by the fangs of the reptile had healed.

Instances have occurred, both among the Indians and among the white people, who inhabit the mountainous and thinly-settled parts of our country, of almost instantaneous death from the bite of the rattlesnake. On the other hand, it is very certain that many persons wounded by this animal have sustained very trivial injury, if any. In such cases, it is probable that the teeth enter obliquely and do not penetrate the true skin, or that the reservoirs at the roots of the fangs have been empty, or the virus itself, owing to particular circumstances, so modified or changed in its properties or in such small quantity as not to produce fatal effects. Again,—where death has followed almost immediately or shortly after the wound, the poisonous fangs have probably penetrated directly an absorbent artery or vein, and conveyed the noxious matter at once into the circulation. According to Catesby, the Indians very soon ascertain when this has happened, and under an impression that the wound is necessarily fatal, apply no remedy. Upon these principles it will be easy to account for the supposed good effects of the numerous and diversified remedies at different times proposed for the cure of the bite of the rattlesnake; inasmuch as there is reason to believe that nature, unassisted, is often sufficient to accomplish a cure, or that a sufficient quantity of virus has not been inserted to produce death.

The poison of the rattlesnake is of a yellow colour tinged with green: during extreme heat, and particularly in the procreating season, it becomes of a much darker hue. The *copperhead* is equally poisonous with the rattlesnake; but few experiments have been made to ascertain its peculiar character.

In Europe the viper is more dreaded than any other poisonous reptile; it would appear, however, to be less deadly than the rattlesnake, and, according to Fontana, (who has studied its history more than any other naturalist, and who has instituted a great number of experiments in order to become acquainted with the operation of its virus,) produces injury or death in proportion to the size of the animal bitten, and to the depth of the

wound—small animals dying almost immediately, and wounds penetrating beyond the skin being equally fatal.

The natives of India often suffer from the bites of the numerous species of *Coluber*, particularly from the cobra de capello, (*Coluber naja*), which is extremely venomous. In many parts of the Eastern continent, the three Arabias and Africa, the *cerastes* or horned viper is extremely numerous, and often by its bite proves fatal. According to Bruce, however, the black people in the kingdom of Sennaar are perfectly armed against its bite. "The Arabs," says he, "have this secret naturally, but from their birth they acquire an exemption from the mortal consequences attending the bite of these animals, by chewing a certain root and washing themselves with an infusion of certain plants in water. One day when I was sitting with the brother of Shekh Adelan, prime minister of Sennaar, a slave of his brought in a cerastes, which he had just taken out of a hole, and was using with every sort of familiarity; I told him my suspicion that the teeth had been drawn, but he assured me they were not, as did his master Kitton, who took it from him, wound it round his arm, and at my desire ordered the servant to carry it home with me. I took a chicken by the neck and made it flutter before him; his seeming indifference left him, and he bit with signs of anger; the chicken died almost immediately;—I say indifference, for I constantly observed, that however lively the viper was before, yet upon being seized by any of these barbarians, he seemed as if taken by sickness and feebleness, frequently shut his eyes, and never turned his mouth towards the arm of the person who held him. I will not hesitate to aver that I have seen at Cairo, (and this may be seen daily without trouble or expense,) a man who came from above the Catacombs, where the pits of the mummy birds are kept, who has taken a cerastes with his naked hand from a number of others lying at the bottom of the tub, has put it upon his bare head, covered it with the common red cap he wears, then taken it out, put it in his breast, and tied it about his neck like a necklace; after which it has been applied to a hen and bit it, which has died in a few minutes: and to complete the experiment, the man has taken it by the neck, and beginning at the tail, has ate it as one would do a carrot or stock of celery, without any seeming repugnance."*

* Bruce's Travels, octavo edition, vol. vii. p. 302.

Wounds from the bites of rabid animals are not always followed by *rabies canina*, or *hydrophobia*; indeed it has been well ascertained that out of numerous persons bitten by dogs undoubtedly mad, very few have sustained material injury. This is owing, probably, to the human system being less susceptible of impression from the virus than that of the lower animals, and to the circumstance of the greater part of the body being covered with clothes, by which the infectious matter is wiped from the teeth, and thereby prevented from entering the wound in sufficient quantity to produce its full effects—to the teeth of the rabid animal not penetrating deep, or not striking a vascular part—to the saliva or venom being in smaller quantity in the animal's mouth at one time than another—and to an *erythismus* in the lymphatics of the wounded part, sufficient to prevent the absorbent action. Dr. Hunter relates an instance of twenty persons bitten by the same mad dog, and out of that number only one took the disease. According to an estimate made by Dr. Hamilton, founded upon numerous facts, about one in every sixteen of the human species bitten by mad dogs, take the infection and suffer from the consequent disease.

Great doubts still exist respecting the peculiar nature or mode of action of the virus, in giving rise to *rabies canina*. Mr. Cline instituted a number of experiments to ascertain whether the saliva of a hydrophobic man, in the last stage of the disease, could, by inoculation or other means, infect the inferior animals, so as to propagate the complaint; but none of the animals into whom fresh saliva was inserted, were in the slightest degree affected, even at the end of three months. It would appear, also, from some experiments by Sir Astley Cooper, that the saliva of a mad dog, inserted by a lancet into the inside of the thigh of a dog, a pig, a rabbit, and fowl, produced no deleterious effect whatever; notwithstanding some of the animals were kept from nine weeks to twelve months.

Between the infection and the appearance of the constitutional disease, the interval is often very various and uncertain. In general, the attack does not commence until after the lapse of thirty or forty days, in some instances no signs of the disease have appeared for twelve or eighteen months, and in one case recorded by Dr. Bardsley, the patient remained perfectly well for twelve years, and then died from the disease. These facts would seem to prove that the system is affected through the me-

dium of absorption, and not from any influence exerted by the virus upon the extremities of the nerves of the part,—an opinion formerly entertained. The wound made by the teeth of a rabid animal heals with as much facility as any other wound, and often is entirely obliterated long before the constitutional symptoms have appeared. It has been observed, however, that when any constitutional disturbance takes place, before the closure of the wound, then, instead of continuing to granulate and discharge a healthy pus, the sore puts on a sloughy character, and the matter becomes thin and ill-conditioned.

The *symptoms* of rabies canina vary very much according to the constitution of the patient; in general, some uneasiness, soreness, or itching is first felt at the wounded part; the spirits of the patient are depressed, and he oftentimes suffers from indescribable anxiety. Occasionally a chill or rigor is the first symptom manifested. At night, the patient's sleep is disturbed by frightful dreams and by spasmodic startings; the pulse is quick and fluttering; the appetite fails; but the thirst is increased. At this period it is generally observed, that when the patient attempts to drink, he is immediately seized with a sudden and spasmodic catch in the breathing, which is increased upon repetition, and finally is attended with indescribable horror and universal agitation. The very idea or thought of liquids is afterwards sufficient to excite the same painful and distressing symptoms, and should the patient have resolution enough to attempt to swallow, or to struggle against the spasmodic and agonizing contractions of the muscles of the throat, the whole system becomes so convulsed, that he finds it impossible to accomplish his purpose. This fear of water, or *hydrophobia*, is not, however, a universal concomitant of the disease; in many instances, it is altogether absent; it is, moreover, an attendant upon other diseases, not in the slightest degree allied to canine madness. But in the worst forms of the complaint it is for the most part present, and of all the individual symptoms by far the most horrible and appalling.

A symptom, less constant than those mentioned, but sometimes very distressing, is a collection of thick, viscid, ropy phlegm, which adheres to the fauces and throat so closely, that the patient finds it extremely difficult and often impossible to throw it out; although the most vehement efforts are employed

for the purpose. In a patient attended by Dr. Marcet,* the quantity of this tenacious lymph was so considerable, and ejected with such extreme torture, that he exclaimed, "Oh! do something for me; I would suffer myself to be cut to pieces! I cannot raise the phlegm, it sticks to me like birdlime."

In the latter stages of hydrophobia the pulse becomes exceedingly agitated and hurried, and the breathing very quick and laborious; the countenance is expressive of great anxiety and fear, the eyeballs glare and seem ready to start from their sockets, and the muscles of the face and neck are horribly contorted. Sometimes the patient becomes altogether furious and unmanageable, and attempts to tear and bite himself and every one near him; but in general he is perfectly inoffensive, and answers questions with great precision and in the most rational manner. He seldom lives beyond the fourth or sixth day, and is either carried off suddenly by a violent convulsion, or expires quietly—his bodily vigour being completely exhausted by inordinate exertions and continued suffering.

The introduction of morbid matter into the system, is sometimes *apparently* productive of the worst consequences. Persons much engaged in the dissection or examination of putrid bodies, or in macerating or making preparations, have occasionally suffered from wounds of the scalpel or dissecting hook, or from punctures made by spicula of bone, &c. In such cases violent inflammation has followed, extending up the arm as high as the axilla or neck, rendering the whole limb exceedingly tense and painful, and finally producing extensive abscesses, sometimes gangrene, and sometimes death. Examples of the kind have been recorded by different writers. Mr. Fyfe, the celebrated anatomist at Edinburgh, informed me that he nearly lost the use of one arm for several years, owing to a wound of the finger by a dissecting knife. Dr. Chambon, of Paris, in attempting to separate a sphenoid bone, which had long remained in maceration, from the other bones of the head, received so severe a wound in one of the fingers as to keep him on the brink of the grave for upwards of three years.† Corvisart,‡ also, in examining a dead body, pricked a finger, in consequence of which the whole arm swelled enormously, and was only relieved by very exten-

* Medico Chirurgical Transactions, vol. i.

† Dictionnaire des Sciences Medicales, tom. ix. p. 649.

‡ Ibid.

sive incisions performed by Desault. Percy relates the case of a student who died, in three days, from dissecting a body which had been kept for several weeks. Mortification took place in the wounded finger, and extended rapidly throughout the arm. Professor La Clerc is said to have lost his life from touching, with a sore finger, the pulse of a patient in a profuse perspiration, who laboured under a malignant fever. Dr. Rush mentions an instance of a young man who died from a wound he received in skinning an ox.* But none of these examples furnish direct evidence of the absorption of morbid virus; since many others might be adduced to show that the same symptoms have followed from apparently trifling injuries, and under circumstances where no virus could possibly have been absorbed. The late Dr. Physick informed me, that he once attended a patient who died from gangrene of the whole arm, simply from a slight scratch of the shell in the act of opening an oyster; and I have known a puncture from a needle in one of the fingers produce nearly throughout the arm most violent inflammation and suppuration. In all probability, then, a simple puncture, in certain constitutions, is capable of producing effects which might easily be attributed to the operation of some specific virus. This conclusion is rendered more probable from what we know to happen in tetanus, which is sometimes produced by the most insignificant scratch, and at other times cannot be excited by the most extensive laceration.†

* Within the last few years several interesting cases have been detailed in which surgeons and medical students have lost their lives, or been reduced to the lowest extremity by slight wounds, received in the dissection or examination of dead bodies. Among these may be mentioned the names of Professor Dease, of Dublin, Dr. Pett and Mr. Newby, of London, Mr. Gerard, Professor of the veterinary school of Alfort, Messrs. Elcock, Shekelton, Graves, Archer, and Hutchinson, students of medicine, all of whom perished in a few days, after having suffered beyond description. Other cases are recorded, too, and these by no means few in number, in which the patients thus wounded, have, though with great difficulty, recovered after a lapse of weeks and months.

† For various illustrations and numerous interesting cases and observations respecting the effects of poisoned wounds, see TRAVERS on "*Constitutional Irritation*."

TREATMENT OF POISONED WOUNDS.

It seldom happens that the stings of bees and wasps are so severe as to require active remedies for their cure. In general, local applications afford speedy relief. A solution of common salt, applied to the part, will produce almost instantaneous ease. This remedy was first introduced, it is said, by Dioscorides, and has since been found serviceable even in the wounds of the *æso-phagus*. An English gentleman saved the life of his friend, who had swallowed unperceived, a wasp in a glass of beer, by causing him to drink plentifully of salt and water.* The *aqua ammoniæ*, applied to a part stung by bees, I have often known to act like a charm. Cold water, rose water, a solution of the acetate of lead or of opium, constantly applied, will, in many instances, soon cause the pain and inflammation to subside. Bleeding and purging, with strict antiphlogistic regimen, will probably become necessary when the patient has suffered from a swarm of bees. The same remedies will be found equally useful for the bites of spiders, flies, musquitoes, and other insects.

In Morocco, where the scorpion is very common, most families keep a bottle of olive oil, in which the bodies of several of these reptiles have been infused, and when bitten apply it to the wound, and with reputed success. A ligature, moreover, is generally placed above the wounded part, to interrupt the progress of the poison, and the wound is afterwards scarified and cauterized. "In Tunis, when any person is stung by a scorpion," says Mr. Jackson,† "or bit by any other venomous reptile, they immediately scarify the part with a knife and rub in olive oil as quick as possible, which arrests the progress of the venom. If oil is not applied in a few minutes death is inevitable, particularly from the sting of a scorpion. Those in the kingdom of Tunis are the most venomous in the world." According to the same author, the *coolies* or porters, who work in the oil stores, have their bodies constantly saturated with oil, and on this account not only never suffer in the slightest degree from the bites of scorpions and other reptiles, which creep over them at night as they sleep on the ground, in great numbers; but there

* Dictionnaire des Sciences Medicales, tom. i. p. 40.

† Jackson's Reflections on the Commerce of the Mediterranean, London, 1804.

is not a single instance known of one of these people ever having taken the *plague*, although the disease frequently rages at Tunis in the most frightful manner.

The use of olive oil has been highly extolled by many writers as a remedy for the bites of poisonous serpents. Dr. Miller* of South Carolina, relates the case of a man who was bitten in the sole of the foot by a very large rattlesnake. Although very little time elapsed before he reached the patient, his head and face were prodigiously swelled, and the latter black. "His tongue was enlarged and out of his mouth; his eyes as if starting from their sockets; his senses gone, and every appearance of immediate suffocation." Two table-spoonsful of olive oil were immediately got down, but with great difficulty. The effect was almost instantaneous; in thirty minutes it operated freely by the mouth and bowels, and in two hours the patient could articulate, and soon after recovered. The quantity of oil taken internally, and applied to the wound did not exceed eight spoonsful. In the course of twelve years, Dr. Miller has met with several similar cases, in which the oil has proved equally successful. Mr. Oliver† has detailed a number of experiments in proof of the efficacy of warm oil, when applied to the wound made by the bite of a viper; but Linnæus‡ found it quite inefficient.

The *volatile alkali* was, for a long time, in very general use as an antidote against the poison of different serpents; but the experiments of Fontana are calculated to show, that so far from being useful, the symptoms produced by the bite of the *viper* were increased either by the internal exhibition of the medicine or by its external application. On the other hand the late Dr. Ramsey§ of South Carolina, one of the most distinguished physicians our country can boast of, has declared "that the *volatile alkali* properly administered, will, in a short time, cure the bite of any snake, or the sting of a spider, or any other venomous insect, is a medical fact as well established as that the Peruvian bark will cure an intermittent fever." Dr. Ramsey's declaration is founded upon the result of several cases, wherein patients have suffered from the bites of rattlesnakes, and have been cured,

* New York Medical Repository, vol. ii. p. 242.

† Philosophical Transactions, vol. xxxix. p. 310.

‡ Amœnitates Academicæ, vol. xi. p. 407.

§ London Medical and Physical Journal, vol. xi. p. 332.

apparently, by the volatile alkali. We are strongly inclined to the opinion, however, that the injuries received were not, independently of the action of the remedies employed, sufficient to cause the patient's death, or, in other words, that spontaneous cures, which we know to be very common, took place. The same remarks may, perhaps, apply to the cases detailed by Dr. Anderson* of Madras, respecting the cure of the bite of the cobra de capello, and by Dr. Brichell† of Savannah, of the rattlesnake and moccason, by means of alkalies. In the latter case, the patient probably would not have died, as it is well known to naturalists that the *moccason* is not a venomous serpent.

As an internal medicine, *arsenic* has been lately found more decidedly beneficial than any other. Mr. Ireland‡ has recorded five cases, in all which the most violent symptoms produced by the bite of the *coluber carinatus*, a poisonous serpent very common at the island of St. Lucia, were, by the use of this medicine, speedily arrested. The supposed efficacy of the Tanjore pill, a medicine very commonly employed in India against the bites of serpents, the chief ingredient of which is arsenic, first led Mr. Ireland to employ Fowler's mineral solution. He gave it to the extent of two drachms every half hour, and repeated for four hours, with the best effects. Severe vomiting and purging followed the administering of the medicine, and the patients were soon after relieved.

When a person has been bitten in the extremities by a serpent supposed to be poisonous, a ligature should immediately be thrown around the limb above the wound, and drawn exceedingly tight in order to interrupt the progress of the venom through the absorbents: after this a portion of flesh for some distance beyond the wound, should be quickly removed by the knife; then the kali purum, the lunar caustic, or the actual cautery, must be applied until an eschar is produced. The wound should afterwards be dressed with some simple ointment. With regard to internal medicines, no objection can arise to the exhibition of oil, volatile alkali, or Fowler's mineral solution; for if useless, they cannot at any rate prove injurious, and upon this principle should be tried.

As *hydrophobia* may still be considered an incurable disease, the great object of the surgeon must always be to secure the pa-

* Medical Repository, vol. ix. p. 109.

† Ibid. vol. viii. p. 451.

‡ Medico-Chirurgical Transactions, vol. ii. p. 394.

tient against its attack. Fortunately this can be accomplished in many instances, by removing the bitten portion of flesh as speedily as possible after the accident, and in some cases even after weeks have elapsed and the wound has healed. Whenever, therefore, we are called to a patient, who has been bitten by a dog or any other animal supposed to be mad, such incisions should instantly be made as will include a portion of flesh greater than the depth to which the teeth of the animal have extended. This operation should be performed, were it only by way of precaution, or in cases where no absolute certainty has existed of the animal being mad. If the surgeon is timid and cuts sparingly, there will be much reason to apprehend that the operation will not prove successful. In general, owing to several teeth penetrating at the same time and at different parts, it will be necessary to remove several distinct portions of flesh. Should the teeth perforate between the bones of the hand or foot, as often happens, so as to leave insufficient room to remove all the injured soft parts, our only resource will be to amputate without delay. By way of security, after the incisions have been practised and the bleeding suppressed, it will be advisable to apply to the wounds the lunar caustic, the kali purum, or, what is still better, equal parts of white arsenic and sulphur, a remedy introduced by Mr. Cline, and extolled by Sir Everard Home as extremely valuable in cancer, and which experience has proved to be the most powerful caustic employed in surgery. By adopting these measures, we shall often have the satisfaction to find the fears of our patient allayed, or the disease consequent to the bite of rabid animals entirely prevented. The same operations should be resorted to, after months have elapsed without any thing having been done for the patient, provided the cicatrix becomes sore or painful, and indicates the approach of the disease. When any doubt exists of the animal being mad, instead of having it killed as soon as possible, as is generally done, it should be confined until the symptoms become so clear as to remove or confirm all suspicion on the subject.

When our operation fails and rabies canina is established, then various remedies may be tried. Of these, opium, mercury, cantharides, volatile alkali, belladonna, musk, arsenic, camphor, lunar caustic, the cold bath, and blood-letting, have been considered the most powerful. Blood-letting, carried ad deliquium animi, has lately been extolled in the highest terms by Mr.

Schoolbred of Calcutta, and some facts have been adduced by Mr. Tymon, assistant surgeon of the 22d English light dragoons, which go to prove, that taking away, at once, an immense quantity of blood, so that scarcely a pulsation can be felt in either arm, has been attended with the most favourable result.* According to Professor Brugnatelli,† several cases of hydrophobia have been cured in the hospitals of Lombardy by the external and internal use of hydrochloric acid. Dr. Physick,‡ some years ago proposed, under the idea that many patients labouring under hydrophobia, died from suffocation caused by spasm of the muscles of the glottis, to open the trachea in order to sustain the breathing, until the effects of different remedies could be fully tried. I do not know of any instance in which the experiment has actually been performed; but am strongly inclined to believe, from the termination of numerous interesting cases, recorded by different writers, in which the chief symptom was a difficulty of breathing and swallowing, to such a degree as apparently to destroy the patient, that decided benefit would result from the practice. Under this impression, should a case present, I would perform the operation of tracheotomy, or else introduce a gum elastic catheter into the glottis and trachea. It is well known that such an instrument may be carried into the larynx, and there suffered to remain for any length of time, without exciting any unpleasant symptom, except a violent and convulsive cough at the moment of its passage through the glottis.

As respects the *treatment* of wounds received in dissection, much diversity of opinion prevails even amongst the most distinguished members of the profession. Some are inclined to trust mainly to the antiphlogistic system, to saline medicines, calomel, antimony, opium, and the local application of lunar caustic. Such is the plan recommended by *Sir Astley Cooper*. *Mr. Travers* objects to the caustic, unless applied immediately after the receipt of the injury, and seems inclined in most cases to prefer the stimulating to the depressing plan of treatment. But he is an advocate for soothing applications and for poultices after the parts have been freely divided in the course of the wound by a sharp lancet. According to *Mr. Shaw*, the most effectual mode of reducing the inflammation of the lymphatics is

* See Cooper's Surgical Dictionary, edit. 4th, p. 611.

† Eclectic Repertory, vol. viii. p. 256. ‡ Medical Repository, vol. v. p. 1.

to "apply lint soaked in the sugar of lead lotion and tincture of opium to the arm, and to take calomel purges, and large doses of opium with plenty of wine and porter." The same gentleman recommends that the finger be wrapped in lint dipped in equal parts of Goulard's lotion and laudanum, and advises to lay open the injured part to the bone when there is reason to believe that the matter has formed.

Fortunately for the profession in this country, injuries from dissection are extremely rare. This may probably be owing in part to the abundant supply of fresh subjects every where to be obtained in the large towns, owing to which students are seldom under the necessity of using such as are decayed or in a diseased state. On this account, too, our knowledge of the treatment of such injuries must be comparatively limited. But much, we are inclined to believe, may be done in all such cases by way of prevention. Professor Chaussier, of Paris, has long been in the habit of advising that each student should carry a vial of butter of antimony in his pocket, and apply a portion of it to the wound immediately after its receipt. Others, with the same view, commend the nitric or muriatic acid. Others, again, by way of prevention, direct the hand to be covered with oils, pomatum, &c., or with gloves. Would not suction by the mouth, or the cupping-glass answer in most cases, if employed immediately after the injury?

Within the last few years, some very interesting and satisfactory experiments have been performed in relation to the pathology and treatment of poisoned wounds. From the result of these, it appears, beyond all doubt, that the old remedy, the *cupping-glass*, recommended by Hippocrates, Celsus, Galen, and others, may be employed to a certainty in the removal of poisons from wounded surfaces or cavities, provided it be resorted to in time, and continued sufficiently long. For the knowledge of these facts the profession is greatly indebted to Dr. Barry.* The following extract will exhibit satisfactorily the whole treatment pursued by this eminent practitioner.

1st. "In all cases of superficial poisoning, when the delete-

*Experimental Researches on the Influence exercised by Atmospheric pressure upon the Progression of the Blood in the Veins, upon that Function called Absorption, and upon the Prevention and Cure of the Symptoms caused by the Bites of Rabid or Venomous Animals, &c., by David Barry, M. D., London, 1826, 8vo.

rious matter is simply deposited in the wound, the application of the cupping-glass over the point of contact will save the individual, provided it be made with the precautions to be noticed hereafter, and before a dose sufficient to cause death shall have been absorbed. 2d. In cases where the poison has been injected, as, for instance, by the hollow fang of a viper or rattlesnake, though the cupping-glass may have been applied, yet as the local action of the venom goes on in vacuo, the parts acted upon should be cut out after the venom has been concentrated and partly extracted by the cupping-glass, which should be immediately reapplied over the wound made by the knife, for the purpose of extracting the contents of the newly divided vessels from a greater distance than could be done before the operation. After this the actual cautery may be administered, if thought necessary; but never, under any circumstances, before the second application of the cupping-glass, for this reason—that when the mouths of the vessels are hermetically sealed by the hot iron, they can give out nothing to the vacuum. 3d. The poisoning that results from the bite of a mad dog, so far as regards the simple deposition of the deleterious matter in the wound, and the total absence of local action upon the wounded tissues, comes strictly under the first or least complicated class of cases. But the tardiness with which the poison is absorbed, or if absorbed, with which it produces its peculiar effects, entitles it to be considered as a species *sui generis*. Fortunately this anomaly does not alter the preventive indications. These are purely physical, and as such must be ever unvaried. The first thing, then, to be done in treating the recent bite of a rabid dog, is to apply a powerful cupping-glass over the wound. This measure supersedes at once the ligature, ablution, excision, &c., during the period of its application, and for a certain time after its removal. After the cupping-glass has been applied for an hour *at least*, the whole of the parts wounded or abraded by the bite, should be freely dissected out. The cupping-glass should then be reapplied immediately for the reasons already stated. The wound should next be hermetically sealed by the actual cautery. The part should be as little exposed to the contact of the air after the slough comes away, and as soon healed as possible.”

On Wounds from Insects, consult Dictionnaire des Sciences Medicales, tom. i. p. 40, article Abeille; also tom. xxv. p. 315; Richerand's Nosographie Chirurgicale, tom. i. p. 104.

On the Bites of Serpents, Fontana on Poison; Barton on the Rattlesnake, in *American Philosophical Transactions*, vol. iii.; Home, in *Philosophical Transactions*, part i. 1810.

On Hydrophobia, see Hunter, in *Transactions of a Society for the Improvement of Medical and Chirurgical Knowledge*, vol. i.; Hamilton on Hydrophobia, vol. i.; Cline, in *Medical Records and Researches*: Bardsley, in *Memoirs of the Literary and Philosophical Society of Manchester*, vol. iv.; Rush's *Inquiries*; Ferriar's *Medical Histories and Reflections*; Fothergill, in *Medical Observations and Inquiries*, vol. v.; Vaughan's *Cases and Observations on Hydrophobia*; Latta's *System of Surgery*, vol. iii.; Mease on the Bite of a Mad Dog; Physick, in *New York Medical Repository*, vol. v.

On Wounds from Dissection, consult Travers on Irritation; Sir Astley Cooper's *Lectures by Tyrrel*; Colles's *Fatal Consequences resulting from Slight Wounds received in Dissection*, in *Dublin Hospital Reports*, vol. iii.; Shaw's *Manual of Anatomy*; Shaw on *Dissection Wounds*, in the *London Medical and Physical Journal*; Thomson on *Dissection Wounds*, in *London Medical Repository*; Duncan, *Cases of Diffuse Cellular Inflammation*, in *Transactions of Medico-Chirurgical Society of Edinburgh*, vol. i.; Case of Mr. Adrian A. Kissam, student of medicine, who perished in a few days after receiving a slight wound in dissecting, reported by John D. Godman, M. D., Professor of Anatomy and Physiology, in *Rutgers Medical College, N. Y.*, in *American Journal of Medical Sciences*, No. ii. Feb. 1828.

SECTION VII.

GUN-SHOT WOUNDS.

UNDER the head of gun-shot wounds are comprehended all injuries from fire-arms, from explosion of shells, rockets, &c. Wounds of this description are oftentimes extremely formidable—destroying the patient immediately or remotely, producing extensive mutilation, or giving rise to abscesses, sinuses, and diseased bones, which last for months or years, or perhaps during the patient's life. The kind and extent of injury must depend, however, upon the form and size of the instrument inflicting the wound, upon the velocity with which it is carried, and a variety of other circumstances. A ball moving with great rapidity and striking the body, enters readily and pursues its course generally in a straight line, either passing through the part or lodging at a greater or less depth. On the contrary, a ball which moves

slowly, enters with difficulty and, instead of following a direct line, is diverted by the slightest obstacle—always taking an angular course. Owing to this circumstance, it often happens that a bullet strikes some part of the body, and apparently passes through; but upon examination it will be found that it has taken a circuitous route—having followed the course of a rib, or traversed the head between the bone and scalp, or passed entirely around the abdomen or neck. In other instances the ball strikes an extremity, runs beneath the skin, or among the muscles, and is lodged many inches, or even two or three feet, beyond the point which it entered.

The opening, made by a ball where it passes out, is always larger and more ragged than that by which it entered—because it passes from the body, which is a *dense* medium, into the air, which is a *rare* one. On the other hand, the contusion is greater at the place the ball enters, than at that from which it emerges—owing to the velocity of the ball being more considerable when it first strikes, than it is afterwards; hence the first opening is small, round, comparatively insensible, and discoloured, not unfrequently casts off a slough, and seldom heals except through the medium of granulation; while the last, approaching to the nature of an incised wound, is inflamed and painful, and often heals by the first intention. Two openings, however, are not invariably found; for in many instances the ball does not pass through, but lodges in the substance of a muscle, or in a bone, or immediately under the skin. In other instances it carries before it the clothing, which, according to its texture, is either torn or remains entire. In the latter case, upon withdrawing the cloth, the ball is generally discharged with it. Other extraneous matters beside cloth, may be carried before a bullet, and deeply lodged—such as splinters of wood, buttons, pieces of coin, keys, &c. These always excite more or less irritation. The bullet itself will create as little injury as any other foreign body, provided it remains smooth and round; but if it is flattened or angular, or incrustated with spicula of bone, or in any other manner rendered rough or pointed, great pain and profuse suppuration will generally follow.

Balls are frequently buried and never found. Sometimes they remain stationary, being either enclosed in a cyst or surrounded by bone, and the patient feels no inconvenience from them. At other times they change their position, and travel to a considera-

ble distance, exciting, during their passage, pain and suppuration, and occasionally violent spasms. Not unfrequently they approach the skin and are discharged spontaneously. Balls are sometimes divided by striking the edge of a sharp bone, in which case each portion usually makes a passage for itself. I have met with several examples of the kind. The veteran M'Culloch, who signalized himself at the battle of North Point, had his thigh broken by a bullet, which was divided by the bone, as completely as if effected by a knife or chisel.

A ball moving with great velocity and encountering a bone, passes through it in an instant, making a round and comparatively smooth opening. If the ball move slowly, however, or be nearly *spent*, it will be apt to produce extensive fracture or fissure. In some cases of the kind the cylindrical bones have been splintered more than two-thirds of their length.

Gun-shot wounds, like all other contused wounds, seldom bleed profusely—the vessels being torn with violence, retract and bury themselves among the cellular membrane. Even very large arteries may be torn across, without shedding more than a few drops of blood;* but a vessel partially torn will throw out more blood than one which has been completely separated. Although the vessels bleed sparingly when first wounded, yet in a few days secondary hemorrhage is very apt to ensue, from the detachment of the slough with which almost every tract made by a ball is lined; and from this cause many patients have suddenly lost their lives. A regular slough or dead tube completely formed, is not so invariable a consequence as many surgeons imagine. I have met with several cases where no vestige whatever could be discovered of a slough from the commencement to the termination of a wound. When a slough does form, it is liable to be detached at some period between the *fifth* and *twelfth* day, and during this period the patient should be closely watched. It happens frequently that an artery is merely brushed by a ball, and yet its coats are so much injured that in a few days an eschar separates from it, and gives rise to profuse hemorrhage. In other cases large arteries are pushed entirely to one side by the passage of balls, without sustaining the slightest injury. This happened, there is reason to believe, to Captain Worth,† a gal-

* It must be understood, however, that when arteries, such as the carotid or femoral, are cut by a bullet, the patient dies almost instantly.

† The late General Worth, a distinguished officer of the army, who died recently of the Asiatic cholera.

lant young officer, at the battle of Bridgewater, who received a shocking wound in the thigh by grape-shot, several ounces in weight, which penetrated a little below the groin over the course of the femoral artery, and tore up the muscles in a frightful manner, without injuring the vessel.

The nerves suffer immensely in some gun-shot wounds, especially those of the extremities. Even after the wound has healed, painful and very distressing sensations are often felt, particularly during an easterly wind; and when the atmosphere is charged with electricity.

Many surgeons believe that very serious accidents, and even death, may result from the *wind* of a ball; but there is no foundation for such an opinion. The truth is, that a musket, and even a cannon-ball, will now and then strike a part so obliquely, as not to enter or produce the slightest external wound, and yet the bones are crushed and the muscles dreadfully bruised. If it were possible for the *wind* of a ball to produce the mischief attributed to it, this ought always to follow whenever the ball passes very near the body. So far from this being the case, numerous examples are afforded of portions of clothes, hats, &c. being shot away, without the person wearing them sustaining any injury. There is, however, a real and oftentimes very serious injury, which some have supposed imaginary, resulting from a gun-shot wound,—a perturbation and extraordinary constitutional agitation, which the bravest men cannot resist. This is not an invariable symptom; for some patients are desperately wounded and do not exhibit any alarm whatever; whilst others are immediately seized with trembling, vomiting, and indescribable anxiety, even from the slightest scratch. Where such constitutional disorder, however, continues any length of time, it is to be considered generally very fair evidence of the severity and danger of the wound.

TREATMENT OF GUN-SHOT WOUNDS.

It is very important, in all gun-shot wounds, to suppress hemorrhage and extract the foreign body as soon as possible. If an artery be torn across, and continues to pour out blood copiously, we shall have good reason to conclude that its size is considerable, (for the smaller vessels seldom shed more than a few drops,) and the sooner we attempt to secure it the better. In many

instances the part must be laid open freely, until we reach the mouth of the vessel, and secure it by ligature. Frequently, however, the vessel, from its depth or situation, cannot be tied; in such a case a compress thrust to the bottom of the wound and supported by a roller, may perhaps succeed. But the surgeon must not in every case, think of dilatation, even although the hemorrhage be profuse; otherwise he will incur great risk of wounding important organs, or of opening arteries larger than those divided by the ball.

As soon as the flow of blood has diminished or ceased, the wound should be carefully examined, either by the finger or by some other instrument. If the finger be too large, or not sufficiently long to reach the bottom of the wound, recourse must be had to the *long gun-shot probe* or to a wax bougie, or flexible gum catheter, or to the *urethra sound* of Bell; all of which are very superior to the small probe contained in the common pocket-case. Previous to the introduction of an instrument, the wounded part should be placed, as nearly as possible, in the situation it was in at the time the wound was received. Without this precaution, the surgeon will often experience great difficulty in reaching the spot where the foreign body is lodged, and will give the patient unnecessary pain. There are very few cases in which an examination cannot be made immediately after the receipt of the wound; for if the patient be overcome by the shock or nervous agitation, which is so commonly felt, this may speedily be removed, in most instances, by a little wine or spirits, or by a glass of cool water. Severe pain should never be an obstacle to examination, which should always be conducted with gentleness and care. If the wound be not examined immediately after its receipt, the lips soon close, and the whole tract becomes so much swelled, and so painful, that it is almost impossible afterwards to ascertain the course the ball has taken, or the spot at which it is lodged. On the contrary, when the probe is carried along the passage recently made, it glides with facility, and at the bottom frequently encounters the ball or some other foreign matter, which must either be drawn out immediately by the forceps, or through a counter opening made directly over it. Provided the exact position of the ball be accurately marked at the time of examination, there will be no necessity, in all cases, for removing it at once; it may be left sometimes until the wound is healed. Mr. Hunter disapproves of making a counter opening

at all, except the skin covering the ball should be deadened by the contusion and likely to slough. The experience of modern surgeons, however, proves that a counter opening may, generally, be resorted to with safety and advantage, unless the ball should lodge more than one or two inches from the surface.

Forceps of various shapes have been contrived for the removal of balls. In general, they are too clumsy, and so large as to fill up nearly the whole passage—leaving very little room for the expansion of the blades. The *forceps* of *Chevalier* and those of *Percy* have this fault, in common with the rest, but are superior to most instruments of the kind. Very narrow *forceps*, longer and more slender than those contained in the common pocket-case, with small and very sharp teeth, I contrived several years ago, and have found them much superior to any others I have tried, particularly in those cases where the ball has not been lodged beyond three or four inches in depth; and where it has been deeper seated, advantage has seldom been gained from attempts to remove it by other means. A ball may sometimes be extracted very readily by the scoop, or by a single blade of *Percy's* *forceps*. The scoop of *Thomassin** is said to be the best instru-

* "M. Thomassin has constructed a scoop which is more easy of application, and more effectual than the ordinary instrument. It is one of the best instruments which could be devised for the extraction of balls. It is formed of two branches, which slide upon each other by means of a groove. That which, properly speaking, is the body of the instrument, is eight inches long; at one of its ends is a kind of spoon, which is deep enough and sufficiently curved to contain and hold the ball; the other end has two rings, one on each side to receive the fingers; it is hollowed at its anterior and concave part; the other branch is exactly of the same length of the first, with the exception of the ring at its extremity; it is fitted to the groove of the other; its point is cut into an edge, so as to correspond to the edge of a scoop, which is received into a groove near its edge. This groove prevents the branch from going farther from the scoop. The *biseau* is intended to enter into a ball, so as to retain it in a spoon. A screw passes through this branch a little below the rings, the ends of which pressing against the branch of the *biseau*, serve to fix it when necessary. This branch is graduated on the convex part of the other ring, so that the operator is able to judge of the size of the ball when it is in the spoon of the instrument. The two branches being united, are introduced to the bottom of the wound, and held like a pen. When the ball is touched by the end of the scoop, it is clenched, and the *biseau* is raised about an inch. The *biseau* is fixed at this height by half a turn of the screw. The scoop is then opened to receive the ball, and is easily passed along its side. When the ball is felt in the scoop, the instrument is to be used so as to dislodge the ball from the parts around: half a turn of the screw then sets the *biseau* at liberty, and it is to be pushed upon the ball, by placing the thumb of the left hand in the ring, while the middle and index finger act upon the scoop. We may

ment of the kind ever invented. An instrument admirably calculated to remove a bullet deeply situated, and at the bottom of a narrow passage, was made under my direction several years ago by Mr. Schively of this city. It is the "*curette articulée*" of Leroy D'Etiolle, invented by him for the purpose of extracting fragments of stone from the urethra, after the operation of Lithotripsy. To adapt it to the removal of a bullet, it was necessary to enlarge the original instrument considerably. In other respects it is unaltered. For a description of the urethra instrument, see vol. ii., section LITHOTRIPSY.

It has been proposed, for the removal of a bullet lodged in a bone, to employ the trephine, or else an instrument formed at its end like a gimlet. The former can seldom be necessary, and the latter could not be used in most cases without giving the patient great pain. (See plates II. and III.)

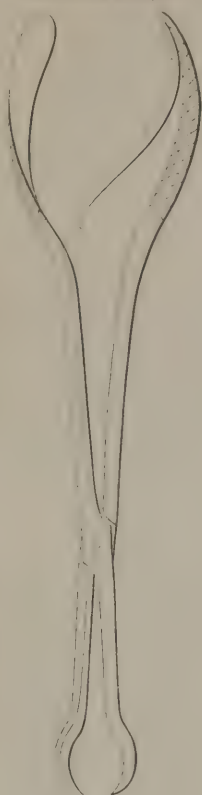
After the ball has been extracted, or searched for in vain, our attention must be turned to the dressings best adapted to the wound. Some surgeons, particularly Kern, Assalini, Percy, and Guthrie, highly extol the use of cold water, or even of ice-water when it can be procured, and direct that the part be constantly wet by pledgets. Since the war of 1812-15, my opportunities of treating gun-shot wounds have been comparatively limited, and at that period I was not aware of the reputation of the remedy, although it would seem that its efficacy was well known to the older surgeons, as Blondus published an essay on its virtues as early as the year 1542. I am inclined to think, however, that after the first few hours, during which the tension, heat, and pain are considerable, that the remedy will be found, if not injurious, at least less useful than an emollient poultice. At any rate, I have derived very great benefit from such applications from the very commencement of the wound, and have seldom seen injury result from their use, even when unnecessarily continued. The poultice should be applied until the swelling subsides and a free discharge of matter takes place from the wound, which may then be dressed with some mild ointment. Adhesive straps and rollers should be avoided in the commencement of gun-shot

pass its point into the ball, by a strong pressure or a turn of the screw. We are now sure of our object: however, we must not draw out the ball with violence, but, on the contrary, extract it very carefully. We consider this the best instrument which has been devised for the extraction of balls."—*Boyer's Surgery*, vol. i. p. 187.

Ball, thin short Probe



Charrière Forceps



Thin short Forceps

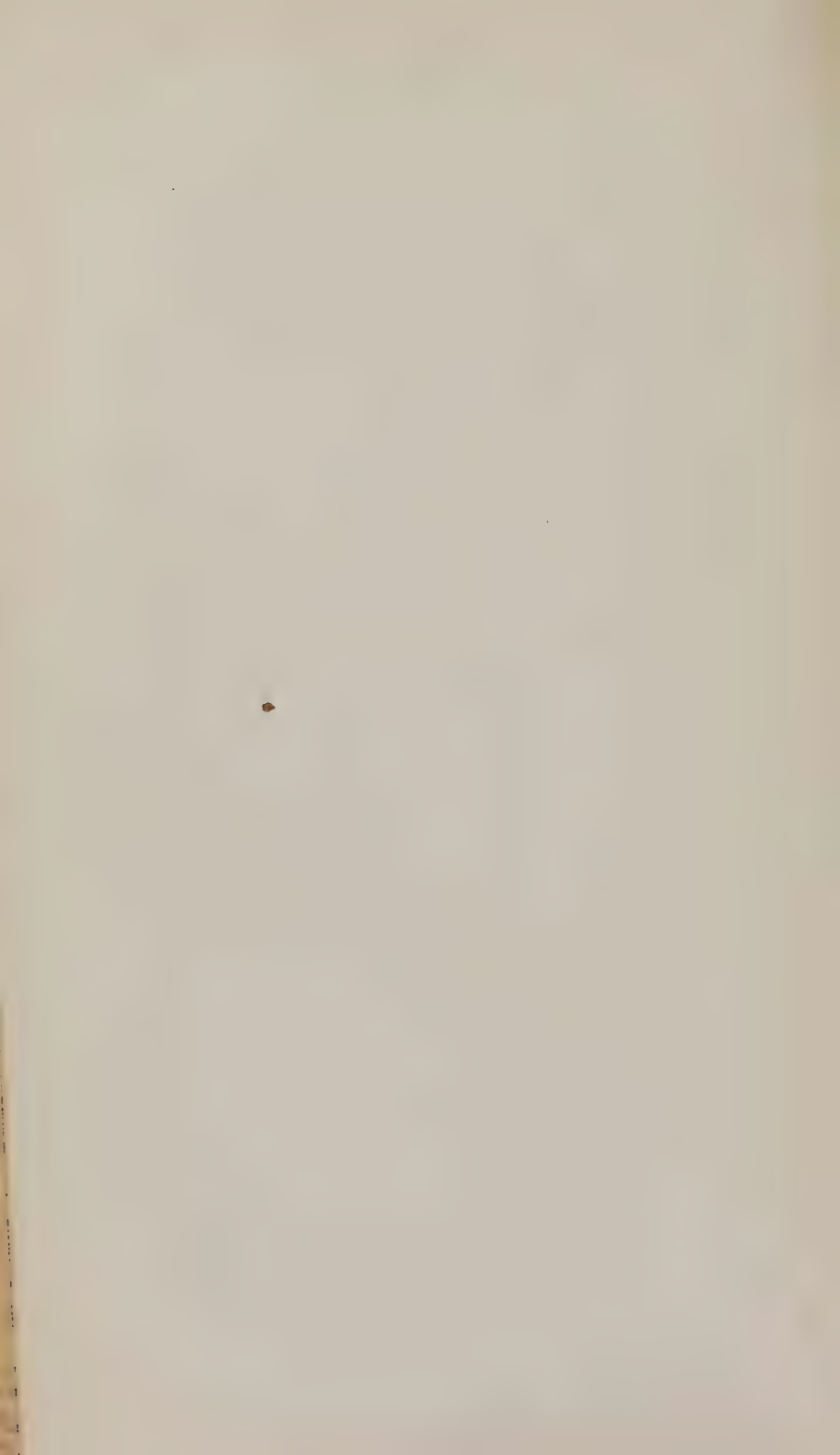


Scoop



Long thin short Probe





Forceps, separated as in Fig. 1.



Forceps, as in Fig. 2.



Forceps, as in Fig. 3.



wounds, but it will often prove useful during the suppurative stage.

The older surgeons were fond of cramming the orifice of the wound with lint, of making ample dilatations, and of conveying setons throughout the whole track made by the ball. These practices are now nearly exploded, and in their place the mildest and most simple means substituted. The symptomatic fever which commonly follows severe gun-shot injuries, must be combated by blood-letting, purging and low diet. After the fever subsides and the wound suppurates abundantly, it may become necessary to support the patient by a generous diet, and by the use of bark and mineral acids. Oftentimes the wound remains fistulous and will not heal, owing to the presence of some extraneous matter, which should always be searched for. The severe wound of the shoulder received by General Scott, at the battle of Bridgewater, continued fistulous for many months; but closed permanently in a few days, upon my extracting from it a small piece of cloth. Where matter burrows under fasciæ and travels among muscles and tendons, ample incisions and counter openings only will put a stop to its progress.

The propriety or impropriety of removing a limb injured by a gun-shot, will be considered under the head of *Amputation*.

See Hunter on Inflammation and Gun-shot Wounds; Chevalier on Gun-shot Wounds; Larrey's Memoirs; Guthrie on Gun-shot Wounds of the Extremities, London, 1815 and 1820; Thomson's Report of Observations made in the Military Hospitals in Belgium, 1816; Hennen's Principles of Military Surgery, 2d edition, the most valuable work perhaps ever published on the subject; Charles Bell's Dissertations on Gun-shot Wounds; Mann's Medical Sketches of the Campaigns of 1812, 1813, 1814; Sir Charles Bell's Surgical Observations, p. 319; Dupuytren, Leçons Orales; Hippolyte Larrey, Hist. Chirurg. du Siège de la Citadelle d'Anvers, Paris, 1833.

SECTION VIII.

WOUNDS OF THE HEAD AND FACE.

THE scalp being very vascular and abundantly supplied with nerves, is apt to suffer severely from wounds and contusions. An instrument pushed between the integument and bone, and creating a punctured or penetrating wound, will often give rise to an erysipelatous inflammation, which extends over the whole head and face, producing great pain and distress. At other times a slight blow on the head will cause an effusion of blood between the scalp and bone. This blood may remain stationary for months, forming a considerable tumour, and at last by pressure render the bone carious. Sometimes it has been mistaken by the surgeon for fracture of the skull. Such tumours are now and then met with on the heads of new-born infants, and are owing to pressure during the passage of the child through the pelvis.

Extraordinary nervous symptoms, such as great pain, spasmodic twitchings of the muscles of the face, paralysis of the limbs and even convulsions, resembling epilepsy, occasionally arise from contused wounds of the scalp; and what is remarkable, these symptoms do not appear, in many instances, until months or years after the injury. *Pouteau* was among the first to notice these singular affections, and to point out the proper remedy.

Incised and *lacerated* wounds of the scalp are by no means uncommon. The first generally proceed from sabre-cuts in battle, and it often happens, under these circumstances, that considerable portions of the bone, and even of the brain and its membranes, are sliced off with the scalp, without producing the patient's death. Several such cases are related by military surgeons, and many years ago I myself attended a patient,* whose left parietal bone had been forcibly struck by a hand-saw, the teeth of which penetrated the bone, dura mater, and brain, and produced a fissure in the bone three inches long, without giving rise to a single bad symptom. It has been remarked by Dr. Hennen, that sabre-cuts on the top of the head are not by any

* A servant of Richard Caton, Esq., of Maryland.

means so dangerous as those on its side. *Lacerated* wounds of the scalp generally proceed from rough bodies forcibly driven against the head, or from the passage of cart or carriage wheels over it, while the patient lies on the ground. These wounds, from being covered with dirt and blood, frequently present a very frightful appearance; but in truth are not so dangerous as some other injuries, provided they are properly treated.

Gun-shot wounds are more formidable than any other wounds of the head, and few patients recover from them, where the skull has been fractured and the brain injured. It is true there are examples to the contrary—where the skull has been extensively shattered, the ball lodged in the substance of the brain, and afterwards successfully extracted. One instance, indeed, is recorded by Hennen, of a French soldier, wounded at the battle of Waterloo, by a bullet, which passed through the squamous portion of the temporal bone and lodged in the substance of the brain. The wound was freely dilated, and the ball found imbedded in the posterior lobe of the right hemisphere of the brain, where it rested on the tentorium. It was extracted, along with some portions of brain that adhered to it, and the patient in a short time recovered. The same writer states, that he has known five cases, where a ball has lodged in the substance of the cerebrum, without immediately producing a fatal event. These are all to be looked upon, however, as anomalies—curious rather than useful.

A bullet does not always enter the brain, even although it should fracture the skull. Sometimes both tables are fractured and depressed, and the ball rests immediately under the scalp. Sometimes it passes between the scalp and bone, many inches beyond the spot at which it entered, and without injuring the bone in the slightest degree. Sometimes the ball is divided into two pieces, each of which takes a separate route; and frequently the ball is so flattened or changed in shape, by impinging against the bone, that it is hardly possible to recognise it. In all cases where the ball has travelled any distance under the scalp, its course may be known in a few hours, by the red stripe or inflamed line, which traverses the surface of the skin covering it. The same may be observed in all other parts of the body. Frequently a bullet fractures the superciliary arch and lodges in the frontal sinus. In other instances it is buried beneath the aponeurosis or belly of the temporal muscle, and great tensions, swelling and

distress are the result. In short, it is hardly possible to calculate the course a ball may take when it strikes the head, or the effect it will produce; for the most trivial injury frequently terminates in death, contrary to our expectation; and on the other hand, injuries apparently the most desperate, sometimes result in the happiest manner.

Bertrandi,* an eminent French surgeon, was among the first to notice the fact, that abscesses of the *liver* frequently follow wounds and other injuries of the head. His observations were soon after confirmed by Andouillé,† and the experience of modern surgeons has demonstrated the frequency of the occurrence. The same connexion, according to Klein, exists, and to a greater degree, between the liver and the shoulder joint. Many theories have been framed in explanation of these circumstances, but none of them appear satisfactory.

According to Hennen, Larrey, and others, wounds on the back of the head, are sometimes followed by atrophy of the genital organs and loss of the procreative powers.

Wounds of the face may involve the eye, nose, lips, salivary ducts, &c. The *eye* may be burst by a blow, or the humours evacuated by an incised or punctured wound, or one or both eyes may be torn out by the passage of a ball. It happens now and then that a ball passes into the orbit and lodges between it and the bone, without destroying the patient's sight. Sometimes the destruction of one eye will cause a paralysis of the other. Wounds of the supra-orbital nerves almost invariably give rise to amaurosis, and there is probably no instance on record in which the patient has perfectly recovered his sight after such a wound. Painful and very troublesome fungi often sprout from a wounded eye, and sometimes the whole globe becomes enormously enlarged, and protrudes from the socket. *Diplopia* or double vision, may follow an injury of the eye, or of the parts in its immediate vicinity.

Wounds which open the cheek, and divide the *parotid* duct, frequently give rise to a very troublesome disease—*salivary fistula*. This fistula forms almost immediately, if the wound is not treated in a proper manner, and, indeed, it is sometimes impossible to prevent it, even under the best management. From the

* De hepatis abscessibus qui vulneribus capitis superveniunt. In Memoires de l'Academie Royale de Chirurgie, tom. ix. p. 130, edit. octavo.

† Idem, p. 168.

fistulous orifice there is a constant and copious discharge of saliva, especially during mastication. This passing over the cheek, excoriates it, and, together with the fungus, which almost always sprouts from the opening, renders the patient's situation very uncomfortable.

The *ear* is sometimes completely severed from the head by a sword or ball. It might be supposed, in this case, that the sense of hearing would be diminished or destroyed; but this is not found to happen.

The *nose* and *lips* may be wounded in a similar manner, and instances are recorded of the greater part of the face, including bones as well as soft parts, being divided by a sabre in the most shocking way; and yet the patients have recovered, without much deformity.

The *tongue* being protected by the mouth is seldom injured, except by a bullet or by the teeth. In battle it frequently happens that a ball enters the mouth, carrying before it a number of the teeth; these are forcibly driven into the tongue, palate, or adjoining parts, and produce a lacerated and dangerous wound. At other times the ball enters one side of the lower jaw, fractures it, and passing through the tongue emerges at the opposite side of the face. I met with several cases of the kind after the battle of North Point, and found them extremely difficult to manage. The tongue, when thus wounded, is very apt to become paralyzed and crooked, and secondary hemorrhage after such accidents is by no means uncommon. During epileptic fits, and other convulsions, the tongue is sometimes almost separated by the teeth; indeed, in some instances, it has been completely bitten off.

TREATMENT OF WOUNDS OF THE HEAD AND FACE.

The first step to be taken in all wounds of the head, is to shave the part accurately. From inattention to this preliminary measure, important injuries have escaped observation, and caused the patient's death. The surgeon should, therefore, not be satisfied with the removal of a few locks, from the immediate vicinity of the wound, but should shave to the distance of several inches, and if necessary, clear the whole head of every particle of hair. This being done, the most careful examination must be made, in order to ascertain whether the bone is injured, or

whether the scalp alone has suffered. In the former case it may become necessary to use the trephine—provided the symptoms justify it—in the latter, local applications, calculated to prevent or subdue inflammation, such as cold water, leeches, and blisters. When the wound is incised or lacerated, and the scalp separated from the bone and turned down, it should be washed, if covered with dirt or blood, carefully replaced, and stitched with the interrupted suture, unless adhesive straps and bandages are sufficient to keep it in its natural situation. The older surgeons invariably cut away the injured scalp, by which the bone was left bare and made to exfoliate. The moderns always attempt reunion, even if the scalp be ever so much torn, and for a very good reason—the part cannot be rendered worse by the attempt, and may be completely restored.

Bloody tumours of the scalp resulting from contused wounds, should never be opened, unless they become very large, remain for a long time, or proceed from the wound of some large vessel which pours out blood copiously, and requires the ligature. Ordinarily these tumours are absorbed in a few days.

When the scalp remains tender and painful for months or years, and spasms are excited by pressure on the affected part, the most certain way of removing the complaint is to make a free and decided incision to the bone. *Pouteau* practised this operation with great success; and the celebrated case of *Magdalen Mondet*, recorded in his "*Mélanges de Chirurgie*," proves the efficacy of the remedy. Dr. Physick for many years pursued the same plan, though not always with the desired effect. When the incision failed, however, he sometimes succeeded by repeated doses of emetics; indeed, emetics alone will occasionally effect a cure; in other instances, they prove of no service, and the disease remains incurable. In two or three cases I have prescribed the extract of belladonna with great relief.

For the removal of the *erysipelatous affection* which so commonly follows a punctured or penetrating wound of the scalp, there is nothing so useful as nauseating antimonials, the blue pill, mild purging, and abstinence. For this practice we are chiefly indebted to Desault.

Gun-shot wounds of the head must be treated upon the principles formerly pointed out; but especial care should be taken not to search too diligently for a ball that has passed through both tables of the skull, lest more injury result to the brain and

its membranes, from the officiousness of the surgeon, than from the presence of the extraneous body.

With the exception of salivary fistula, the treatment of wounds of the face is commonly very simple. When the nose, lips, eyelids, and ears, are incised or lacerated, we bring the edges together by a few tacks of the interrupted or twisted sutures, and support them by adhesive or court-plasters, and by bandages, taking care to secure, *in the first place*, the angles or hanging portions of the flesh; in order to obviate the deformity, which otherwise is apt to follow, from one edge overlapping the other. The common roller has superseded all the particular bandages formerly contrived for the head.

There are three modes of treating a wounded or fistulous parotid duct—by *compression, seton, and caustic*. The first is generally employed immediately after the duct is wounded, and with a view to procure direct reunion. Owing to the difficulty, however, of approximating the two ends of the duct, and of holding them in exact contact, permanent benefit seldom follows any attempt of the kind. On this account, the wound, in almost every instance, becomes fistulous and requires a regular operation, or the caustic. Monro, the father, was very partial to the seton, and Desault, with particular modifications, preferred it to any other mode. His plan was to introduce two fingers into the patient's mouth opposite to the fistula, to keep the cheek tense, while from behind he passed forward a small trocar and cannula through the cheek, immediately before the posterior end of the duct. The trocar was then withdrawn, leaving the cannula, through which a thread was conveyed into the mouth. This thread was attached to a seton, then carried from within outwards, but not sufficiently far to fill up the external orifice, in which the thread alone rested. The wound was dressed daily, for six weeks with lint, the patient kept on a low diet, and the jaw as still as possible. The seton and thread were then withdrawn, and the external orifice touched with lunar caustic until it healed. Simple as this operation may appear, it will be found by no means free from difficulty, and although successful in the hands of the dexterous Desault, can hardly fail to embarrass the inexperienced surgeon. I have strong doubts, however, of the propriety of resorting to the operation, under any circumstances, without the previous trial of other remedies, especially the caustic, which has proved successful in almost all the cases in which I have used it.

When the *eye* has been so severely wounded as to be irrecoverably lost, the surgeon will save the patient much pain and distress by an incision, sufficiently free to evacuate suddenly all the humours. The mildest dressing should then be employed, and if troublesome fungi afterwards sprout, repeated applications of the *argentum nitratum* will be found sufficient to repress them. The antiphlogistic system, to the fullest extent, is commonly demanded in such cases.

It is often extremely difficult to manage a wounded *tongue*, especially as the accident most frequently occurs amongst maniacs, or persons subject to convulsions. The best plan in all cases, is to pass the interrupted suture through the substance of the tongue, and connect the wounded edges to each other—afterwards taking care to prevent the teeth from irritating the parts by interposing some contrivance calculated to keep them asunder. The machine of *Pibrac*, described in the ninth volume of the “*Memoirs of the Academy of Surgery of Paris*,” and which consists of a piece of wire, having attached to it a bag, sufficient to contain and support the tongue, is perhaps as well calculated to answer the purpose as any other.

When the *ear* is wounded, and nearly separated, it should be stitched like any other dependent part, and afterwards firmly supported against the head, by compresses and bandages.

See Desault's Works, vol. i.; Pott's Works, by Earle, vol. i.; Pouteau's Posthumous Works; Hennen's Principles of Military Surgery, p. 277; Thomson's Report of Observations made in the Military Hospitals in Belgium, p. 49 and 63; Discourses on the Nature and Cure of Wounds, by J. Bell; also his Principles of Surgery, vol. i. Part II.

SECTION IX.

WOUNDS OF THE NECK.

EXTENSIVE incised or deep penetrating wounds of the neck are very apt to prove fatal,—owing to the large and numerous

blood-vessels and important nerves with which it is supplied. If the carotid or vertebral arteries be cut across by a sharp instrument, or by a ball, the patient dies instantly. It is true a few cases have been recorded of recoveries after such accidents; but these are so extremely rare and the circumstances attending them so peculiar, as not to affect the general position—that such accidents are mortal. The most common wounds of the neck are incised, and these are generally made by the attempts of suicides. These attempts, however, frequently fail, owing to an impression, which almost universally prevails—that wounds of the *windpipe* are necessarily fatal. Under this idea most suicides aim at the division of the larynx or trachea simply, and carry the cutting instrument as high up on the neck as possible. On this account the carotids, which retire deeply in proportion as they ascend the neck, escape—when even a superficial wound, low in the neck, would open them. A patient may die, however, from hemorrhage, without the carotids being touched—from the division of the thyroid or lingual arteries. Frequently it happens, that these vessels are divided and bleed furiously, and the patient faints. The surgeon being called during this interval, draws out the arteries and secures them. When the thyroid gland is wounded deeply, the hemorrhage is very copious and often fatal.

A mere division of the larynx or trachea is, comparatively, unattended with danger. Some surgeons have doubted the possibility of wounding the œsophagus, without dividing at the same time the large blood-vessels and nerves, but several examples to the contrary are recorded. When the neck is wounded above the os hyoides, numerous muscles, the root of the tongue, the lingual artery, and perhaps the salivary ducts, the ninth pair of nerves, and the pharynx, may be divided. An opinion has long been entertained that a division of the eighth pair of nerves is necessarily fatal. Klein, a celebrated German surgeon, not only questions the statement, but denies positively that it is founded in fact. The experiments of Haighton, however, prove that the nerve on one side of the neck may be wounded without producing the death of the animal, but that the division of both nerves is inevitably fatal.

TREATMENT OF WOUNDS OF THE NECK.

In many instances the patient dies of hemorrhage before the surgeon can reach him, having completely severed the carotids, thyroids or jugulars: at other times he is found weltering in blood and almost lifeless. The surgeon takes advantage of his reduced state, sponges away the clotted blood and seeks the divided vessels. These being secured by ligature, the edges of the wound are brought together by adhesive plaster or sutures. In extensive and deep wounds sutures are indispensable; they should only pass, however, through the integuments and muscles, and not involve either the larynx or trachea, otherwise a troublesome cough and incessant irritation will be kept up. It has been too much the practice to use sutures upon all these occasions, whether the wound be extensive or not. In superficial wounds adhesive straps answer every purpose, and should be preferred to sutures, inasmuch as they obviate deformity, and prevent considerable pain. Over the straps or sutures it will be sufficient to place a light pledget or bandage.

Maniacs, who have attempted suicide, should be confined by the strait waistcoat to prevent them from tearing open the wound, to which they are exceedingly prone. In all cases the position of the patient's head is of great consequence as respects the healing of the wound. Writers usually recommend the head to be brought forward, and supported on the breast. The practice I am sure is objectionable, inasmuch as the parts overlap, and uniting irregularly and in an unnatural position, create deformity by leaving an ugly gap. To prevent such consequences I have, for many years, employed a common *leather stock*, similar to that worn by military men, which, being slightly confined to the neck, has supported the chin and kept the head in a natural position. An oval hole cut in front of the stock has enabled me to dress the wound without disturbing the patient, or changing the position of the wounded parts. No bandage, however contrived, can retain the patient's head immoveably fixed. On this account assistants should constantly sit by him and keep it steady with their hands.

The *elastic catheter*, although recommended both in wounds of the trachea and œsophagus, with a view to prevent motion of the larynx and to nourish the patient, will be found, I conceive,

seldom necessary, and in some cases cannot be employed without exciting great irritation. When the neck is laid open above the os hyoides, so as to leave the pharynx gaping, and fluids run out of the wound as soon as they are introduced into the mouth, then the catheter becomes extremely useful, and indeed indispensable; but to introduce it upon every common occasion, whether the pharynx or œsophagus be touched or not, merely for the purpose of preventing the motion of the windpipe, is manifestly improper, inasmuch as it cannot remain in the œsophagus for any length of time, while the surrounding parts are highly inflamed, without great inconvenience to the patient; and to introduce it every time he requires drink, and generally the thirst is incessant, would be productive of more irritation than any efforts to swallow in the natural way could possibly occasion.

According to Liston, great danger often results from too close approximation of the wound, and from inhalation of blood. He also mentions instances of loss of voice and other serious consequences from feeding patients through the wound.

See J. Bell's Discourses; C. Bell's Operative Surgery, vol. ii. p. 22; Allen's Surgery, vol. i. p. 425; Thomson's Report, p. 71; Liston's Surgery, 3d edit. London, 1839, p. 397.

SECTION X.

WOUNDS OF THE CHEST.

ANY one acquainted with the structure of the organs contained within the chest, would naturally conclude that it was hardly possible for a sword or bullet to pass through the lungs or large vessels, without inflicting a mortal wound. Recoveries, however, are so common after severe and apparently desperate wounds of this description, that few surgeons of the present day look for an unfavourable result, even in the worst of cases. This calculation would seem well grounded, when we recollect the statement of Dr. Gregory—"that of twenty-six wounds of the tho-

rax received at the battle of Quebec, two only were fatal.”* On the other hand, it should not be concealed that many patients die instantaneously from wounds of the chest, or linger months or years in the greatest distress, and finally sink from profuse discharges of matter and from hectic fever. Dr. Hennen calculates strongly upon recovery in almost every case, provided the patient survive beyond the first forty-eight hours. “I have seen so many wounds of the thorax,” says he, “both from pike and sabre thrusts, and from gun-shot, do well ultimately, that I cannot but hold out great hopes where the third day has been safely got over.”†

The great danger of all wounds within the cavity of the chest consists in the hemorrhage. This may proceed from a wound of the lungs, or of the intercostal artery, or from both at the same time. When the *lungs* are wounded, the patient is instantly seized with difficult respiration, accompanied by great anxiety and a flow of blood from the mouth, which as it is poured out from the wound, enters the air cells of the lungs and occasions a distressing sense of suffocation. These symptoms are sufficient to assure the surgeon of the nature of the case: it is possible for the lungs to be wounded, however, without the patient’s coughing up blood, especially if the wound is so situated as to permit the blood to escape into the cavity of the chest, as often happens. A wound of the *intercostal* artery may proceed from a shattered rib or from the instrument inflicting the wound; in either case the blood may flow into the chest, or out of the external wound. Hemorrhage from this source is neither so profuse nor so dangerous as has commonly been imagined.

Another consequence of wounds of the chest, although not a frequent or dangerous one, is *emphysema*, or a collection of air in the cellular membrane adjacent to the wound, and spreading thence in some instances throughout the whole cellular tissue of the body, creating an immense windy tumour, inconvenient to the patient from pressure rather than pain. This collection of air may arise from a wounded lung, or from a simple opening in the cavity of the chest: in either case the air is forced into the cellular membrane, in consequence of the wound being partially closed by coagulated blood, by a change in the position of the muscles and other parts adjacent to the wound, or by extraneous substances blocking up the track made by the instrument

* Hennen’s Principles of Military Surgery, p. 387.

† Ibid.

inflicting the wound. Emphysema from a wounded lung may become very general and extensive, while that from a simple opening into the chest must necessarily be very limited.

An opinion commonly prevails that a wounded lung will always collapse. This is by no means the case; for although it really happens in most instances, and is the great safeguard of the patient, by allowing the wound fair opportunity to heal during the quiescent state of the lung, while retired to the bottom of the chest and ceasing to perform its function, yet many examples are recorded of an opposite state—a protrusion of more or less of the lung from the external wound, which has occasionally given rise to very troublesome and even fatal consequences.

Supposing the patient to have escaped the immediate dangers of his wound—hemorrhage, emphysema, &c., he may yet be doomed to suffer immensely, and perhaps die, from the effects of inflammation. *Suppuration* is soon established within the cavity of the chest, which is denoted by rigors, a flushed cheek, difficulty of breathing, pain and swelling in the injured side, and not unfrequently by a sense of fluctuation. Sometimes matter is coughed up from the lungs, but generally it accumulates in the chest until the quantity is so large and its presence so intolerable that the patient is suffocated unless relieved by the operation for *empyema*. At other times the wound becomes fistulous, and quantities of matter are constantly discharging from the opening, or are drawn off at stated periods. The extraneous bodies, such as broken and exfoliated ribs, pieces of cloth or bullets, often contribute in no small degree to its secretion, by falling into the chest and lodging on the diaphragm, where they keep up perpetual irritation. Many patients survive for years under these circumstances, while others perish in a few weeks from debility, or confirmed phthisis pulmonalis. Upon dissection, the injured lung is generally found contracted and indurated, its cells consolidated, and the whole volume so diminished as to occupy a very inconsiderable portion of the chest—leaving it, in fact, almost empty.

Many wonderful cases have been recorded by the older surgeons and by modern writers, of wounds of the *heart* and *large vessels* in its neighbourhood, without being followed by instant death—the patients surviving for days or weeks. Paré, Bonetus, and Morgagni, give detailed accounts of such accidents, and more recently Babington, Chastenet, Featherton, and

Fuge have furnished very interesting particulars of similar cases.

Superficial wounds of the chest are seldom productive of much injury, inasmuch as there is little danger of hemorrhage—the vessels being small and few in number. An exception to this occurs, however, in the case of a wounded *infra* or *supra scapular* artery. The former vessel in particular is liable to be cut across, and pours out blood so insidiously, that the surgeon is scarcely aware of the hemorrhage, until the patient is nearly exhausted. After death the whole cellular tissue, and even the interstices of the muscles from the shoulder to the loins, are found loaded with blood. I have met with two cases of this description, both of which proved fatal in a few hours. A ball striking the chest obliquely, is very apt to take an angular or circuitous route—by following the course of a rib: in some instances it has run entirely around the chest, and emerged near the spot at which it entered. Many owe their lives to this accidental deviation of a bullet.

TREATMENT OF WOUNDS OF THE CHEST.

The moment the surgeon casts his eye upon a person wounded in the chest by a sword, lance, or bullet, and sees the blood streaming from the wound, or issuing from the mouth, he may calculate immediately upon the nature of the case, and should lose no time in affording relief. He must draw blood copiously from the arm, which will have the effect of diverting it from the lungs, and thereby save the patient perhaps from suffocation. From thirty to forty ounces may be drawn with perfect safety. The blood-letting must be repeated according to the urgency of the case, and indeed can hardly be carried too far; for if the patient be not relieved by this measure, no other can possibly save him.

After the hemorrhage from the mouth and wound has diminished or ceased, the attention of the surgeon should be directed towards the *removal of extraneous bodies and the dressing* of the wounds. As little probing as possible is desirable. If there be loose and shattered ribs, these must be picked away carefully, or, if not easily gotten at, the wound may be moderately enlarged. It is very seldom that a bullet which has entered the

chest can be found—at least until the establishment of the suppurative inflammation. The best practice, I conceive, is in every instance to close the wound as soon as possible after the removal of foreign matters; even although a considerable quantity of blood be deposited in the chest. Adhesive straps should first be applied, and over these lint and a light compress secured by a roller carried over the greater part of the chest, with sufficient tightness to oblige the patient to breathe by the diaphragm and abdominal muscles. During the cure, frequent repetition of the blood-letting may become necessary; and together with this, purgatives, digitalis, low diet, and occasional doses of opium, to relieve the cough, will be found extremely useful.

Emphysema is a very rare occurrence after wounds of the chest, and may always be prevented, there is reason to believe, by an accurate closure of the wound. When it does occur, a few decided incisions or punctures as near the seat of injury as possible, followed up by bandaging, will speedily effect a cure.

The so much dreaded hemorrhage from a *wounded intercostal artery*, may generally be stopped by a compress judiciously applied. Gerard proposed to secure the vessel by a ligature, to which was attached a dossil of lint passed around the rib by a curved needle. This plan was tried successfully by Plenck, but a similar operation in the hands of Theden, caused the patient's death. Hennen, a most experienced military surgeon, never found it necessary to employ even the tenaculum.

When a wounded lung *protrudes* beyond the walls of the chest, it should be carefully returned by the fingers; when it forms adhesions with the surrounding parts, as sometimes happens, and becomes strangulated, it should be left to slough away. The ligature, recommended and practised by some surgeons, ought never to be used.

The treatment of the secondary or *suppurative* stage of a wound of the chest will often prove as tedious and difficult as that of the primary symptoms. As soon as it is ascertained that matter has collected within the chest, in such quantity as to create urgent symptoms or endanger the patient's life, the operation for *empyema* must be performed for its removal,—provided the wound in the chest has entirely closed. Between the sixth and seventh rib is the proper place to make the opening, which should not extend beyond an inch and a half. The muscles

being cut through, the pleura is exposed and opened cautiously with a bistoury or lancet. Many patients are immensely relieved upon the discharge of the matter, but others become suddenly debilitated and very soon die. If a fistulous orifice remain, an opening into the chest may not become necessary, unless as a counter opening,—which may serve to drain off the pus more completely than could be done through the fistulous orifice, owing perhaps to its high situation. To empty the chest completely through the fistula, the surgeon will find it most convenient to lay the patient on his side, so as to make the position and outlet as dependent as possible. In four or five cases I have succeeded in floating out with the matter, pieces of cloth and bits of exfoliated bone, by throwing in an injection of tepid milk and water. These substances kept up considerable irritation and promoted the secretion of matter, which soon after their removal nearly ceased.* During the whole course of the suppurative stage the patient should enjoy a good diet and fresh air. Tents, if possible, ought to be dispensed with, as they prevent the wound from healing, and, if worn long and habitually, cannot be removed without detriment to the patient's health.

See J. Bell's Discourses; Hennen's Military Surgery, p. 367; Larrey's Memoirs; Halliday on Emphysema.

On the subject of Emphysema, consult Hey's Practical Observations in Surgery, p. 494, edit. 3d, 1814; Sharp's Critical Inquiry, p. 231.

* In a very interesting case,—that of the late Captain G——n, of the United States Navy, wounded in a duel in 1810,—the beneficial result of such treatment was particularly exemplified; for, from the time I commenced the use of the injections, his health improved so rapidly as to enable him to take charge of the Constellation frigate and go to sea, where he remained for months with very little inconvenience. Finally, however, he died, partly from the effect of constitutional irritation, and partly from the reproduction of matter, and the detachment of additional portions of carious ribs and vertebræ, which found their way into the chest, lodged on the diaphragm, and could not be removed, inasmuch as the patient was unwilling to submit to a *counter-opening*, suggested by myself as well as his surgeon, Dr. Parsons, who, upon post-mortem examination, had reason to believe that if such proceeding had been resorted to, notwithstanding the entire loss of one lung, recovery would have been probable.

SECTION XI.

WOUNDS OF THE ABDOMEN.

WOUNDS of the abdominal viscera have generally been considered not less perilous than those of the chest and some other parts. The danger must obviously depend, however, upon the particular organs wounded, and upon the extent and kind of wound inflicted. The peritoneum, being endued with exquisite sensibility and extremely prone to inflammation, sometimes suffers immensely even from the most trivial accident, and is the chief source of mischief in all abdominal injuries. Inasmuch, therefore, as this membrane envelops most of the viscera of the belly, and is more or less concerned with those of the pelvis, it can hardly escape any instrument which may pass beyond the muscular or tendinous parietes. Many cases have occurred, nevertheless, in which balls and swords have passed completely through the abdomen;—transfixing the peritoneum and several convolutions of intestines, not only without producing the patient's death, but without giving rise to a single bad symptom. Such favourable terminations are readily explained, when we recollect the remarkable property possessed by all serous membranes of taking on speedily the adhesive process, which serves to prevent effusions and to obliterate in a wonderfully short time all traces of the wound. This adhesion is brought about by the universal pressure of the abdominal muscles and diaphragm upon the viscera of the abdomen, by which they are kept in close contact with each other and a vacuity completely prevented, and by the serous effusion poured out almost immediately from the abdominal and intestinal peritoneum, which agglutinates the surrounding parts and closes the wound. The older surgeons were in constant dread of fæcal effusions between the intestines and the walls of the abdomen, and resorted to many useless and dangerous expedients to counteract the supposed tendency. The experiments of the celebrated Petit, put to flight all idle fears on this point, and proved that effusion from penetrating wounds must necessarily be of rare occurrence. When effusion does take place, however, whether of bile, blood, or the contents of the stomach, or intestines, as occasionally happens from extensive wounds, or from violent blows, rupturing the intestines and giving rise to

ulceration, the patient hardly ever recovers, but dies in a few days in great torture—from universal peritoneal inflammation.

Superficial wounds of the abdominal muscles or their integuments seldom prove of much consequence, and are to be treated upon common principles. To ascertain whether an intestine or some other internal viscus be wounded, is often by no means an easy matter. Frequently it happens, that a ball enters the abdomen and passes out at the opposite side, leaving two openings, having penetrated apparently all the intermediate viscera, when in reality its course has been diverted by the resistance of the tendinous or muscular walls of the belly, and it has ranged between these and the intestines—brushing their coats without opening their cavities. In this way many patients have escaped when the surgeon has supposed the bowels extensively wounded. But a wound of this description is often not less dangerous than one which penetrates the intestines at once; for in a few days a slough separates from the bruised viscera, and opens a direct communication between them and the external wound. The *most certain* sign of a wounded intestine is the discharge of blood from the anus, or of fæces, bile or food from the wound. The absence of such signs, however, is no proof that the viscera remain entire. In general, we may calculate upon some large vessel being opened, or some important organ being injured, when we find the patient's countenance sunk and covered with a cold sweat, his extremities cold, his breathing difficult, and the nervous energy very much exhausted.

Wounds of the small intestines, especially the *duodenum*, are much more dangerous than those of the large, inasmuch as there will be greater difficulty of nourishing the patient, and more risk of effusion. An intestine sometimes protrudes a considerable distance beyond the external wound, although it has sustained no injury; in other cases it is extensively wounded, and along with the omentum projects beyond the parietes of the abdomen. Instances are recorded of the protrusion of the whole of the intestines except the duodenum.

Wounds of the *stomach* are extremely hazardous, and in nine cases out of ten mortal. Dr. Thomson saw but two patients recovering from such wounds, after the battle of Waterloo. Dr. Hennen never had an opportunity of treating a wounded stomach; and hence, perhaps, it may be concluded, that most patients die immediately upon the receipt of such injuries. Many wonderful

examples are to be found, especially among the older writers, of perfect recoveries after wounds of the stomach, even under the most desperate exigencies.

Wounds of the substance of the *liver*, where large vessels are opened, are almost certainly fatal; but patients frequently recover after slight injuries of the viscus. A very interesting case of a most desperate wound of the liver, followed by perfect recovery, is related by Hennen.*

Wounds of the *kidney* generally prove fatal, immediately or remotely—either from effusion of blood or urine; but the *urinary bladder* is often pierced by balls and other instruments, without producing the patient's death. "We saw no fewer than fourteen cases," says Dr. Thomson, "recovering, in which the bladder had been penetrated by musket-balls."† During the war of 1812–15, I had two patients who received bullet wounds in the bladder, between which and the rectum communications afterwards formed—causing an admixture of the urine and fæces. A musket-ball lodged in the bladder has served as a nucleus for a stone, to get rid of which the patient has sometimes undergone the operation of lithotomy.

Wounds of the *genital organs* are not very common, but very distressing when they do occur. Sometimes the whole scrotum sloughs away and leaves the testicles bare; at other times, fungous excrescences sprout from the testicles themselves, and are very difficult to manage. In other instances, the testicles are irrecoverably destroyed, from the diseased action induced by the injury.

TREATMENT OF WOUNDS OF THE ABDOMEN.

The surgeon should make it a rule, when called to a wound of the abdomen, to spare the probe and finger as much as possible. Such examinations, too often thoughtlessly made, can do no good, and have been the cause of great mischief. When there is reason to believe that an extraneous body, a bullet, or piece of glass, has merely passed through the muscular parietes, and lodged on the surface of the peritoneum, the finger should be introduced, and if felt, an attempt made by the forceps to extract it; but when the foreign body has entered deeply among the viscera, or has taken a circuitous course, it will be quite use-

* Page 430.

† Report, p. 108.

less to attempt to follow it. Sometimes a bullet has been discharged by stool, after the surgeon has made repeated and vain efforts to reach it by the probe.

When a portion of intestine protrudes from the external wound, distended with flatus, and not reducible by mere pressure with the fingers, many of the older and some of the modern surgeons advise puncturing it with a needle or fine trocar. This practice I consider dangerous and unnecessary, inasmuch as a slight dilatation of the wound will relieve the stricture and restore the gut. Besides, experience has proved that a puncture does not always answer the purpose; for the opening is immediately closed by mucus, or, as Mr. Travers contends, by the villous or mucous coat of the gut. Should the external wound be large, it may be found difficult to retain the protruded gut after it has been restored, unless a suture be employed. In this case it should be used; but the adhesive strap ought first to be tried. If the omentum should adhere to the edges of the wound from being long protruded, it may with safety be cut off and the individual vessels tied.

To arrest internal hemorrhage and combat inflammation, venesection, low diet, and rest in the supine posture, are the proper remedies. Purging is out of the question; but mild enemata may be used with advantage in particular cases.

As respects the management of a *wounded intestine*, much controversy has prevailed, and to a certain extent still exists. I believe it may be stated, however, that the most experienced surgeons concur in reprobating the interference of the surgeon in the generality of cases—under the impression that nature, unassisted, will do more for the patient than art can ever accomplish by the most ingenious contrivances. Cases, however, undoubtedly occur, though very rarely, in which it may become necessary to stitch a wounded bowel. For this purpose two operations only, so far as I am acquainted, are resorted to at the present day—those by the *interrupted* and *continued* sutures. The former is strenuously advised by Mr. John Bell, the latter by Mr. Travers. Although I have had frequent occasion to treat wounds of the intestines, I have never yet been under the necessity of employing a suture in a single case, having trusted always to the general means pointed out, and to simple dressings. Dr. Hennen declares, that “in the course of a very extensive practice, (and perhaps no military surgeon ever had more,) two cases

only have come under his notice where stitching was required to a wounded intestine." Should a case present itself which, from the extent of the wound and other circumstances, seemed to require a suture, I should be inclined to follow the plan of Mr. Bell, and simply employ one or more tacks of the *interrupted* suture, merely for the purpose of connecting the wound in the gut slightly to the external wound. Sir Astley Cooper tied up an opening in a gut, by passing a ligature around it in the manner we encircle the mouth of a bag, and cut off the ends of the ligature close to the knot: the patient recovered without a bad symptom. Many years ago I performed a similar operation in a case of hernia, and with equal success. From experiments made by Dr. Thomson and others upon inferior animals, it has been ascertained that the ligature, when thus placed upon a wound of the intestine, finds its way through the coats of the gut, and is discharged by stool. Although sutures are so seldom necessary for the wounded intestine itself, they are often extremely serviceable, and indeed indispensable, for holding together the edges of an extensive external wound—for, without such support, it would frequently be impossible to prevent the whole contents of the abdomen from escaping. They should always in these cases be well supported by adhesive straps.

It has been proposed in the event of blood *largely effused* within the abdomen, to make an opening and evacuate it; and instances are recorded where the operation has been successfully practised. The experience of the best modern surgeons is against the operation—upon the ground that peritoneal inflammation of a fatal character always precedes the symptoms that would seem to justify the measure.

An *artificial anus* not unfrequently follows a gun-shot wound of the intestines. In all the examples of this description I have seen, spontaneous cures have taken place, after the contents of the bowels have been discharged for several weeks through the fistulous opening—which has healed up very soon after the *fæces* have resumed their natural route. The treatment of the complaint, when it proves obstinate, will be considered under the head of *Hernia*.

The treatment of *wounds of the stomach* must be very decisive. We draw blood copiously from the system and keep the patient as low as possible, both to subdue inflammation and to prevent any food introduced by the mouth from finding its way into the

cavity of the abdomen, where it would be liable to excite great irritation. Stitching will, in most cases, be unnecessary, and indeed perilous. When resorted to, however, the interrupted suture should be passed in such a way as to connect the edges of the stomach with those of the surrounding muscles and integuments—instead of sewing up the stomach alone. A case admirably adapted to prove the importance of this mode of treatment, occurred many years ago in Harford County, Maryland, in the practice of the late Dr. Archer, an eminent physician, by whom it was communicated to Dr. Physick, who always related the circumstances in his lectures. The patient must be nourished for some time by glysters, and this will be found the most difficult part of the treatment.*

For wounds of the *liver, spleen, pancreas, and kidney*, but one plan can be pursued—the lancet and whole antiphlogistic system. When the *urinary bladder* is injured in such a way as to give rise to urinal infiltration, the elastic catheter will prove immensely serviceable, and indeed is our only resource, independently of the depleting plan, which must not be neglected. Escharotics will rarely prove powerful enough to subdue the fungus which sprouts from a *wounded testicle*. Nothing less than the knife will answer, by which all the diseased parts must be

* “Mr. Travers, in the *Edin. Journ. of the Med. Sciences*, for Jan. 1826, relates that a female, aged 53, and the mother of *nineteen* children, inflicted on herself a wound in the abdomen, three inches in length, and in a transverse direction. When admitted into St. Thomas’s Hospital, at the expiration of six hours, the greater part of the large curvature of the stomach, and arch of the colon, and the entire large omentum, were protruded and strangulated in the wound. The omentum was partially detached from the stomach, which organ was wounded in two places; one, half an inch long, through the peritoneal coat; the other, a perforation of all the coats, admitting the head of a large probe and giving issue to a considerable quantity of mucus. Patient faint; pain slight; pulse 102, and irregular; some hiccup. A silk ligature was placed around the small puncture in the stomach, and the displaced viscera returned, after enlarging the external wound. This last was closed by the quill suture. Warm fomentations and abstinence from food and drink enjoined. Second day, some reaction; had been sick in the night from some drink given; is free from pain; pulse 120; pain on pressure; an enema ordered. *Evening*, a dose of castor oil, and twenty leeches to the abdomen. Third day, much fever: V. S. $\bar{\text{z}}$ xviii., and 20 leeches to the abdomen; bowels not opened. Fourth day, two stools; pulse 98; tension of the abdomen; three more stools during the day. Fifth, sutures removed; wound united except at its right extremity, where a serous fluid is discharged in considerable quantities. On the sixth day, was allowed food, and on the 23d of December, about two months after the accident, was discharged cured.”—*North Amer. Med. and Surg. Journ.* No. III. p. 199.

sliced away, in order to make room for sound granulations and the healing process.

See Hunter on Inflammation and Gun-shot Wounds; J. Bell's Discourses; Travers's Inquiry into the Process of Nature in repairing Injuries of the Intestines; Hennen's Military Surgery, p. 401; Allen's Surgery, vol. i. p. 444; Scarpa on Hernia, Memoir 4th, p. 288; Smith's Inaugural Essay on Wounds of the Intestines, published at Philadelphia, in 1805; Larrey's Essay on Wounds of the Urinary Bladder; Sir Astley Cooper on Hernia, fol. 2d edit., by Key; Experimental and Critical Inquiry into the nature and treatment of wounds of the intestines, illustrated by engravings by Samuel Gross, M. D., Professor of surgery in Louisville Medical Institute, &c. &c. Louisville, 1843—a work replete with valuable information, pathological and practical, and in every way worthy of the high reputation of its author.

SECTION XII.

WOUNDS OF THE JOINTS.

I MIGHT next consider wounds of the *extremities*; but these, when simple or not complicated with fractures, are to be treated upon the principles already laid down. Gun-shot and other extensive injuries, involving shattered bones, will be discussed under the heads of *Fractures* and *Amputation*. In this place a few peculiarities attending the condition and treatment of wounded joints may be pointed out.

Wounds of the larger joints are among the *most dangerous* accidents in surgery; and although numerous cases are met with in writers, of perfect recoveries after such injuries, these do not affect the general position, but must be referred to peculiarities of constitution and to causes not easily explained. The same may be said of those wounds of the smaller articulations, trivial in the eyes of the surgeon, but in defiance of all calculation sometimes followed by tremendous symptoms, and even death. So far then as cases go, both sides of the question, as respects the harmless or perilous nature of wounded joints, might be equally well supported; and in proof of this I may mention, that

I have known a bullet pass directly through the knee joint of a dragoon, between the heads of the bones and among the ligaments, without being followed by any serious symptoms—in another case the knee joint torn open and completely exposed, by the machinery of a steam engine—in a third, a *complete* dislocation of the knee, in which the leg was turned outwards and placed at right angles with the thigh, produced by the limb being entangled in the spokes of a carriage-wheel, and yet the patients all recovered in a very short time.* On the other hand, I may state, that I once saw a patient, apparently in good health, die from amputation of the finger in the Edinburgh Infirmary, and in another instance, most violent symptoms ensue from a trivial wound of a joint of the great toe.

When any of the large joints are opened by an incised, lacerated, or gun-shot wound, there is an immediate discharge of synovia, and this will be a sufficient indication of the nature of the case. It is possible, however, for the surgeon to mistake the fluid contained within the bursæ mucosæ, or within the sheath of a tendon, for the synovial fluid. Sometimes a punctured or penetrating wound extends obliquely into a joint, and the synovia does not escape, owing to the narrowness and length of the passage. The constitution suffers exceedingly in most cases from a wounded joint. A coldness, or rigor, with sick stomach, is speedily induced, and this is followed by high fever and delirium, sometimes by twitchings or convulsions, with excessive pain and inflammation in the joint. The synovia is soon increased in quantity and rendered thinner than natural, and in a very short time coagulable lymph is thrown out on the surface of the synovial membrane and ligaments. Suppuration is soon after established, and the matter discharged in great quantity from the wound, or from fistulous openings around the joint. Finally, the bones become carious, and the patient is either worn out with hectic and irritation, or saved only by amputation. Occasionally the symptoms slowly subside, anchylosis takes place, and an imperfect cure is brought about. At other

* These cases all occurred several years ago in Maryland. The dragoon belonged to Captain Littlejohn's troop, and was wounded at the battle of North Point; the second case occurred on board the steamboat Enterprise, and the third in the family of Mr. Pechin. The last was a boy sixteen years of age, and attended by Dr. Taylor and myself.

times the patient is carried off by tetanus after the wound has nearly healed.

“In referring to my notes,” says Dr. Thomson,* “I find that we have taken notice of the principal symptoms that had occurred in more than sixty examples of wounds of the knee joint. Most of those wounds had been inflicted by musket-balls; but we saw a few which had been made by canister and grape-shot, and also some made by the lance. In a great proportion of the wounds of the knee joint, the local and constitutional symptoms were peculiarly severe. Several had died of these wounds, and others were in imminent danger of doing so, before the symptomatic fever should undergo such an abatement as to warrant the amputation of the limb. Great pain, tension, and swelling of the joint itself, were usually accompanied with œdema of the foot and leg, and not unfrequently with an erythematous swelling of the whole limb. This erythematous swelling often extended up to the trunk of the body, and rendered it impossible to perform amputation in cases in which the removal of the limb seemed to be the only means by which the life of the patient could be secured. It terminated, in some instances, in extensive abscesses round the knee and in the cavity of the ham, which took the direction sometimes of the thigh and sometimes of the leg. In other instances, this inflammation terminated in erysipelas; and in others, again, in gangrene and actual mortification of the foot and leg. In a few instances, it is true, balls had passed through, and in others, they appeared to be lodged in the joint, or in the ends of the bones which compose it, without the patients appearing to have suffered much from constitutional fever or from local inflammation. These instances, however, were rare in comparison with the number of those whose lives were in danger, from the injuries which their knee joints had sustained. In the dissection of several of the knee joints after amputation, I found that the balls in passing through the joints had fractured the ends of the bones, and had occasioned in the synovial membranes and cartilages appearances very similar to those which occur in scrofulous affections of the joints. The cartilages were loosened, in some instances, from the bones; in others, they were partially absorbed; and in the divisions of the cartilages produced by fracture, the edges were rounded off by absorption;

* Report after the battle of Waterloo, p. 136.

the synovial membrane was much thickened in substance, and covered by soft, velvet-like, spongy granulations." Dr. Thomson met with numerous instances of gun-shot wounds of the *ankle joint* after the battle of Waterloo, and from the severe symptoms attending them and from their result, is induced to consider such accidents almost as dangerous as those of the knee.

TREATMENT OF WOUNDS OF THE JOINTS.

It has been well remarked by the judicious Hey, that it is easier to *prevent* inflammation in the joints after a wound, than to arrest its progress when once begun. This maxim cannot be too strongly impressed upon the mind of the surgeon, and guided by it he will instantly adopt the most vigorous measures for the patient's relief. He will draw blood copiously from the system, and by leeches from the vicinity of the wound. Immediately afterwards, a very large blister should be applied over the injured part—barely leaving room for dressing the wound, if daily dressing should be required, which is seldom the case for the first few days. If necessary, the blister may be renewed, or a perpetual blister kept up for some time. The patient should be freely purged, and the most rigid abstinence enjoined. Under this treatment, if carried sufficiently far, even the most desperate injury will be placed in a little time under circumstances most favourable to recovery.

The treatment proper for the wound itself must depend upon its nature and extent. A simple incised wound which has laid open the joint, may safely be brought together and retained by adhesive straps. If possible, sutures should be dispensed with; but if absolutely necessary, too much caution cannot be observed in avoiding the capsule of the joint, and in confining the stitches to the integuments alone. Under this management, the wound may, perhaps, heal by the first intention, and thereby save both patient and surgeon a vast deal of trouble.

A *gun-shot* wound of a joint will require a different kind of dressing; for a wound of this description must necessarily suppurate, and will be weeks or months in healing. The surgeon's first object in such a case, is to search after the extraneous body; for, however harmless a ball may prove, while lodged in a muscular part or among cellular membrane, in the cavity of a joint

its presence cannot fail to excite the most violent symptoms; therefore, the probe or finger ought to be introduced in the most cautious manner, and the ball immediately withdrawn if practicable. If it cannot be felt, or if imbedded in the head of a bone so firmly as not to be moved without great violence, it must be left until suppuration takes place, in hopes that it may then be loosened and brought away. In the mean time the orifice of the wound is covered with an emollient poultice, while the measures for preventing or subduing inflammation are pursued with the utmost vigour. After suppuration is fully established, and the fever and inflammation have abated or entirely gone, the patient's system will feel the effect of the antiphlogistic plan, and rapidly sink. The surgeon should watch this change, and instantly adopt an opposite course—administering a good diet, the mineral acids, to check hectic, and perhaps bark and wine. Throughout every stage of the wound itself, the poultice will be found the most agreeable and useful application. All stuffing with tents must be forbidden.

But besides the treatment pointed out, there is one auxiliary not yet mentioned, of immense value, especially in the early stage of all inflamed joints—*position*. If the knee is wounded, for example, the limb should be extended, and at the same time *considerably elevated*, in order to drain the blood from it as much as possible, and thereby lessen the inflammation. For this purpose, pillows, or an inclined plane well covered with quilts, are placed beneath it; or what generally answers a better end, the foot of the bedstead is raised by blocks to the necessary height. Nothing can be more effectual than this simple plan in all injured or diseased joints, and for a knowledge of it the profession is chiefly indebted to Dr. Physick. The limb is kept *extended*, in order that it may prove more useful to the patient, in case ankylosis should ensue. A contrary position ought, however, to be assumed in wounds of the elbow joint, and for obvious reasons.

When the joints are much shattered by grape-shot, or bullets, or by machinery, and the external wound extensive, or the principal vessels of the limb torn, there can be, generally, no question as to the propriety of amputation; and the sooner the operation is performed the better.

Cases occur, however, every now and then, which seem calculated to demolish the best established maxims of the surgeon.

In the month of June, 1832, I was requested by the Count Surveilliers to visit, along with Drs. Chapman and Dubarry, at Bordentown, a young Italian in the service of one of the sons of Lucien Buonaparte. The young man had gone out on the Delaware to fish, and had placed a loaded musket in the bottom of his boat, with its muzzle directed towards him. In the act of throwing out his line, the hook became entangled with the trigger, the gun was discharged, and a large ball passed directly through the left ankle, entering the fibula, perforating the astragalus and tibia, and emerging at a large and frightful opening on the inner side of the ankle. I saw the patient twelve or fourteen hours after the accident; the hemorrhage, which had been rather profuse, was in a great measure suppressed, the joint less swollen and painful than could have been imagined, the constitutional irritation inconsiderable, and the patient comparatively cheerful and unapprehensive of danger. The serious nature of the injury, and the little prospect of recovery, except through immediate amputation, were after full consultation explained to the patient and his friends. He resisted, however, every proposal of the kind, said that his constitution was an excellent one, and that he would rather die than wear a wooden leg. It was, therefore, determined, (notwithstanding the axiom—"that gun-shot fractures of the ankle, *involving the three bones*, are almost necessarily fatal unless amputation be performed,"*)—to attempt to save the limb. The foot was elevated, accordingly, upon an inclined plane, the wounded part supported by small bolsters, and covered with emollient poultices; and by keeping up the antiphlogistic system for some time, and afterwards supporting the constitution, whilst under the wasting influence of the suppurative process, the wound granulated, and at the end of three or four months the patient recovered perfectly, with the exception of an ankylosed joint.

Wounded joints seem to have escaped the notice of most surgical writers, but the following works may be consulted with advantage.

Hey's Practical Observations in Surgery, edit. iii. p. 254; Thompson's Report, pp. 123, 136, 143, 146, 156, &c.; Dorsey's Elements of Surgery, vol.

* Guthrie.

i. p. 101, 2d edit.; Boyer's Surgery, by Stevens, vol. ii. p. 325; Hunter's Commentaries, part i. p. 69; Hennen's Military Surgery.

For a most interesting and romantic account of a wound of the knee joint, received by General Driesen of the Russian service, at the battle of Borodino, from which the patient suffered the most excruciating torture during four years, partly from bad surgical treatment, especially from the use of large quantities of quicksilver introduced into the wound to *amalgamate* the ball, see Surgical Observations, by Charles Bell, vol. i. p. 431.

CHAPTER IV.

ABSCESSSES.

AFTER the general observations on suppurative inflammation and its treatment, in a preceding part of the volume, it will be proper to speak of abscesses in particular situations. In so doing, no attention will be paid to the distinctions pointed out by some of the French writers, whose terms—*cold* abscesses and abscesses by *congestion*—if not nugatory, have at least no very definite meaning, and are calculated to create false impressions, inasmuch as they are founded upon the belief that such collections are independent of the inflammatory process, which, we have every reason to think, has a most important concern in the production and propagation of every abscess.

SECTION I.

ABSCESS OF THE ANTRUM MAXILLARE.

THIS is not a very common disease, but is always painful and difficult to cure. It is met with chiefly among middle-aged persons, and arises generally from decayed teeth, which by irritating the lining membrane of the antrum, produce extensive inflammation and large quantities of very fetid matter. Sometimes the roots of the teeth excite ulceration in the lining membrane, and project into the cavity of the antrum. The disease may also proceed from severe colds, affecting either the Schneiderian membrane of the nose or that of the antrum itself. The fetor of the matter is so extremely offensive in many instances, that it is hardly possible to remain in the room with the patient,

who is also very much annoyed by the circumstance, and complains of its flowing into the mouth and throat, especially at night when lying in bed. The disease may exist for many months, or even years, without the surgeon or patient being aware of its nature. A deep-seated, severe pain is felt in the face, which no application to the part will assuage. The teeth also, in the neighbourhood of the disease, become painful—so much so, that the patient often has them pulled, under the idea of their causing all his distress. Upon these occasions it is not uncommon for more or less matter to flow along the sockets into the mouth—and then the true nature of the affection is discovered. In many instances, however, the face swells gradually, becomes deformed, and the walls of the antrum are distended by the matter, which eventually is discharged through the cheek.

The frontal sinuses are subject to purulent collections within their cavities, though the disease is rare, compared with that of the antrum. Within the last fifteen years I have only met with six cases of the kind. In one of these the matter found its way outwardly, and was discharged at the inner angle of the eye—leaving the fistulous orifice, which proved very difficult to heal. All the patients complained of a troublesome, fetid discharge from the nostril, and of a diminution of the sense of smell.

TREATMENT OF ABSCESS OF THE ANTRUM.

The most simple and perhaps the most effectual operation for the removal of the matter collected in the antrum, has been practised ever since the nature of the disease was understood. This operation consists in the removal of one or more teeth corresponding with the floor of the antrum. The third molaris is generally selected, inasmuch as it is situated near the most depending part of the cavity. Immediately after the tooth is drawn, the matter is often discharged into the mouth. In other instances, it becomes necessary to pass a stilet or small trocar into the cavity whence the tooth has been pulled, and push it gradually into the antrum. After the contents have been completely evacuated, astringent injections of oak bark, tincture of myrrh, &c., may be introduced into the antrum by a small syringe, with a pipe somewhat curved and about two inches in length. The injections should be used four or five times a day, and

to prevent the opening from closing too soon, a bit of bougie must be worn—taking care that it be not so small and short as to slip into the antrum. I have known this to happen, and cause the patient great distress before it could be gotten out. When the quantity of matter has so far diminished as scarcely to be perceptible, and the inflammation has subsided, the bougie may be withdrawn and the opening suffered to close.

Sometimes it happens that collections of matter form in the antrum, and yet the teeth remain perfectly sound. To obviate the necessity of pulling such teeth, La Morier, of Montpellier, proposed to perforate the antrum above the alveolar processes immediately over the third grinder. The disease, however, so seldom occurs, without being accompanied or caused by carious teeth, that such an operation, although practicable, can scarcely ever be rendered necessary.

A third plan for evacuating the purulent contents of the antrum was proposed many years ago, in France, by Jourdain and Allouel—to wash out the cavity by means of a syringe carried up the nostril and into the natural opening between it and the antrum. From numerous experiments made to ascertain the feasibility of this proposal, it appeared that the operation was practicable, but so difficult as to be beyond the skill of common practitioners, and besides not so serviceable, even when well executed, as might have been expected. For these reasons, it is now seldom attempted, and the old operation of pulling a tooth and perforating the antrum is on every account preferred.

An abscess of the *frontal sinuses* is always very difficult to remove, on account of the remote situation of these cavities. Injections through the nostrils can scarcely be made to reach them, and I have derived benefit from no other source than fumigation with *æthiops mineral* or black sulphuret of mercury.

On Abscess of the Antrum, see Hunter on the Teeth, 3d edit. p. 174; Fox on the Teeth; Jourdain in *Mémoires de l'Académie de Chirurgie*, tom. iv. p. 357; Boyer's *Traité des Maladies Chirurgicales*, tom. vi. p. 149; Bordenave, sur les Maladies du Sinus Maxillaire, in tom. xii. of *Mémoires de l'Académie*, p. 1.

SECTION II.

MAMMARY ABSCESS.

THIS disease is not peculiar to lying-in women, although more commonly met with among them than others. Males are also subject to a similar affection. When suppuration forms soon after delivery, it proceeds from cold, or a large accumulation of milk, which, by distending the breast, irritates and gives rise to inflammation. It is seldom, however, that an abscess forms until five or six weeks, or even two or three months have elapsed. A swelling of the breast, accompanied by throbbing and pain, and soon followed by coldness or a severe chill, are the first symptoms. To these succeed restlessness, thirst and fever. Soon after the breast enlarges in every direction, becomes very tense and so exceedingly painful that the patient can scarcely bear the pressure of her own clothes. The secretion of milk is interrupted altogether, or its appearance and properties very much altered. Suppuration is generally established in eight or ten days; but sometimes the process goes on for several weeks, during which intolerable suffering and distress are experienced. The matter is not always collected in one cavity, but may be lodged in separate cysts. One of the most common causes of mammary abscess in this country, so far as my observation extends, is the practice very common among nurses, of feeding women immediately after delivery upon nutritious articles of food seasoned with wine and other stimulating ingredients—instead of observing a strict regimen, and taking such precautions as are indispensable to obviate inflammation.

A variety of mammary abscess, particularly noticed by Hey, of which I have seen several examples, is now and then met with. It begins like a common mammary abscess, but verges with less rapidity towards suppuration. The matter is often discharged from several openings, and these openings become fistulous and lead to narrow sinuses, which wind in every direction among the cellular membrane and glands of the breast. These sinuses, when opened are found nearly filled with a soft purple fungus. The disease may last for a very long time, and indeed there is reason to believe will never get well spontaneously, but

gradually continue to grow worse until the patient's constitution is worn out by hectic.

TREATMENT OF MAMMARY ABSCESS.

It is very important, particularly among puerperal women, to prevent the formation of matter in inflammation of the breast, or in the common language of surgery, to procure resolution. This may frequently be done by judicious treatment. The most effectual remedies are repeated applications of warm vinegar, topical blood-letting by *leeches*, and gentle suction of the breast by the mouth or nipple-glass. General blood-letting is frequently inadmissible amongst lying-in patients, but may be employed, nevertheless, provided much fever be present. Purgatives, in all cases, will be found highly useful, and abstinence indispensable. By these means, together with various local applications, I have frequently succeeded in preventing suppuration. When we find, in spite of all our exertions, that suppuration must take place, we immediately discontinue resolvents, and endeavour to bring the matter to the surface as quickly as possible. For this purpose warm poultices are most useful. When the matter is deeply seated, and approaches the surface very slowly, and the patient is much reduced by severe pain and sleepless nights, an opening with a lancet or bistoury may become necessary, and should be made in a depending part of the breast. The poultice must be continued until the discharge nearly ceases, and then superficial dressings will complete the cure. If sinuses remain, pressure by a roller well applied will soon obliterate them.

In the variety of mammary abscess described by Hey, it is recommended to lay open each sinus completely; without which, it is stated, a cure cannot be accomplished. If I may judge from the result of two very extensive and obstinate cases of the disease which fell under my care a few years since, this severe proceeding may be dispensed with, and a *seton* substituted in its stead. Both patients recovered under this treatment in a very short time. A separate seton was placed in each sinus.

In slight cases of the disease I have sometimes succeeded by covering the tract of the sinus by a firm compress, and supporting it well with a roller around the chest.

See Pearson's Principles of Surgery, p. 77; Underwood's Surgical Tracts, p. 262; James on Inflammation, p. 171; Hey's Practical Observations, 3d edit., p. 522.

SECTION III.

HEPATIC ABSCESS.

IN warm climates, particularly the East and West Indies, where acute and chronic hepatitis are very common complaints, abscess of the liver is often met with, but, in this country, is comparatively rare. The liver may suppurate, however, from other causes than common hepatitis—as from blows or injuries of the head,* from biliary concretions, and from the presence of worms in the biliary ducts. A remarkable instance is recorded by Kirkland, of an abscess formed on the left side about the lowest false rib, from which was discharged a large red worm. “The tumour had broke,” says he, “and discharged a considerable quantity of matter before I saw the man, and the ulcer had degenerated into a fistula; but by the quantity of bile that daily came away along with matter, the source of the disease was evident. I dilated the orifice a little, to give a free exit to the discharge, and in three or four days afterwards a living worm showed itself, which was taken away, and the sore healed in a moderate time. The man could give no account of his feelings, except that he had a deep, dull pain and uneasiness in his left side, below the chest, some time before the gathering appeared; I therefore could not help suspecting, that the worm had entered in at the duct in the duodenum, and crawled to the opposite side through one of the branches of the hepatic duct.”† The late Dr. Thomas Bond,‡ of this city, has detailed a very interesting and extraordinary case (of a Mrs. Holt, who died, after suffering above eighteen months,) of a disease of the liver, occasioned by a worm, twenty inches long and one inch in diameter. Upon dissection, a cavity was found in the external part of the liver, containing nearly two quarts of a fluid mixed with coagulated blood. A very beautiful preparation, made by the late Dr. Wiesenhall of Maryland, of a liver, the substance and ducts of which are filled and perforated in every direction, by numerous and very large lumbrici, which destroyed the child

* *Bertrandi de Hepatis Abscessibus.*

† See Kirkland's *Inquiry into the present State of Medical Surgery*, vol. ii. p. 186.

‡ See *London Medical Observations and Inquiries*, vol. i. p. 68.

by irritation and suppuration, is contained in my surgical cabinet deposited in the University.

Fontanelles* has lately recorded the case of a boy, thirteen years of age, in whom death took place after an illness of ten or fifteen days, from the lodgement of a lumbricus, six inches long, in the ducts of the liver. "The worm was found to have penetrated the ductus communis choledochus, reaching as high as the ductus cysticus and ductus hepaticus. The ductus communis was rent by the worm, the head of which came out through a hole in the ductus hepaticus."

From whatever cause abscess of the liver proceeds, it is characterized by deep-seated pain and swelling in the right side, and in the advanced stage of the disease sometimes by fluctuation which may be felt externally. As in hepatitis, the patient cannot lie, without an increase of pain, upon the left side, and there is always more or less pain in the right shoulder. Rigors precede and accompany the suppurative process, and in a little time the patient's strength is much reduced by irritation, hectic, and not unfrequently by large quantities of purulent matter from the intestines. There is reason to believe, indeed, that in most instances a communication is formed between the intestines and liver, or between the abscess and biliary ducts, through which the matter is poured into the intestines and passes off by stool. In other cases an ulcerated opening is established between the liver and diaphragm, and the pus is discharged into the chest or coughed up from the lungs. By whatever route the matter escapes, whether through the abdominal muscles or by the internal passages mentioned, it generally happens that through the medium of the adhesive process it is enclosed in a cyst, and so separated from the adjoining parts as to prevent all danger of effusion. Sometimes, however, effusion actually takes place from rupture, ulceration, or the want of adhesion; and then the patient dies in a very short time. After the pus has been discharged externally, whether spontaneously or by art, it soon changes its colour and consistence, and becomes sanious, fetid, and ill-conditioned. Many years ago I attended a patient, in consultation with Dr. Coulter of Maryland, from whose right side, between two of the ribs, a large quantity of healthy purulent matter was discharged, which in a few days became so changed in colour as to resemble coffee-grounds, and so continued for

* Johnson's Medico-Chirurgical Review, vol. viii. p. 287.

several months, when the patient died—worn out by hectic and debility. Upon dissection, the fistulous orifice in the side was traced into the liver, or rather into its remains; for the substance of the liver had disappeared, and nothing of its structure could be found except a shell or cyst, somewhat larger than an egg, and filled with the same kind of brownish matter. Similar appearances have been reported by authors.

TREATMENT OF HEPATIC ABSCESS.

Few patients recover after matter has been discharged into the chest, or passed off by the bowels; and all that can be done, under such circumstances, is to protract the life of the sufferer by appropriate nourishment and medicine. When the matter collects in the external part of the liver and makes its way towards the surface of the body, the event is more likely to prove favourable, and many have recovered after large quantities have been discharged through the abdominal muscles.

Surgeons were much in the habit formerly of waiting for the spontaneous opening of the abscess; but experience proves, that the patient's chance of getting well is proportionably increased by an early evacuation of the matter. On this account it is now a practice almost universal among surgeons in India, to make an incision through the intercostal or abdominal muscles as soon as the slightest swelling can be perceived, or indeed without any swelling being evident, provided the nature of the disease in other respects be well ascertained. The operation may be performed with a common lancet, bistoury, or trocar, and requires very little skill. After the discharge of the matter, the patient's strength should be supported by tonics and a good diet—taking care at the same time, not to permit too liberal a supply of food, as the appetite of convalescents from this disease is often voracious, and from being unrestrained has, in too many instances, brought about a relapse and fatal termination. The external wound should be healed as soon as the discharge has so far diminished as to render its reproduction improbable; otherwise a fistula is apt to form.

See Lassus's *Pathologie Chirurgicale*, tom. i. p. 144; Kirkland's *Medical Surgery*, vol. ii. p. 185; *Bertrandi, de Hepatis Abscessibus qui vulneribus Capitis superveniunt*, in *Mémoires de l'Académie de Chirurgie*, tom. ix. p.

130; Curtis on the Diseases of India; Barry's Case of an Ulcer in the Lungs, piercing through the Diaphragm into the Liver, in Edinburgh Medical Essays, vol. i. p. 273; Similar Cases by Kite and Farquharson, in the Lond. Med. Communications and Lond. Med. Memoirs.

SECTION IV.

LUMBAR ABSCESS.

Psoas or lumbar abscess, although common in Europe, is rarely met with in the United States. That this assertion is correct, will perhaps be admitted, when I state that I have seen only twelve cases of the disease during the last twenty-three years, although professionally connected with extensive hospitals during the greater part of the time.* In Great Britain the complaint is so frequent, that it is hardly possible to pass through the wards of any common infirmary, without meeting with several cases.

The symptoms are pain in the lumbar region, extending from the kidney down the outside of the thigh—the testicle of the affected side is drawn up, and there is more or less uneasiness and pain throughout the course of the spermatic cord. The patient is fatigued upon taking the slightest exercise, and whilst in bed relaxes the muscles of the thigh and leg in order to relieve partially the uneasiness which is constantly felt. These symptoms often continue for several months nearly stationary, and then a change is observed, which is indicated by rigors, loss of appetite, and other symptoms of hectic, denoting the formation of matter. In the neighbourhood of the psoas muscle there is abundance of adipose substance; this is filled and surrounded by matter in such a way as to separate many parts from their connexions and to form a cyst, extending in many instances considerably below the groin. Sometimes the matter drops down near the rectum, or passes through the ischiatic notch, or above, or below, Poupart's ligament. In a case, lately presented to me, at the

* Dr. Physick informed me that he never met with a case of psoas abscess in America unconnected with disease of the *spine*.

Philadelphia Hospital, the abscess formed a communication with the urinary bladder and the urine and pus were intermingled. In whatever situation the tumour presents, it may be felt soft and fluctuating—projecting in the erect, and receding in the recumbent posture.

The consistence and colour of the matter, in some instances, do not differ from common pus; but generally the fluid is thin and gleeety, and mixed with small flocculi, or with lumps resembling curds or cheese. After a time ulceration takes place in some part of the swelling, and the matter is suddenly discharged in large quantity, weakening the patient so much that he cannot survive more than a few days; or else the contents of the cysts are poured off gradually through a narrow aperture, and in this way the patient's life may be protracted, or a spontaneous cure brought about.

The causes of this complaint are very obscure. It occurs chiefly among the lower orders of people, such as are scantily fed and clothed, and exposed to the vicissitudes of weather and great hardships. In Britain it is said to be more common among scrofulous persons than others, and that adults are more subject to the disease than children. Between twenty and forty years of age, according to Abernethy, are the periods at which the disease is most apt to occur. Sometimes the vertebræ become carious, but whether antecedently or subsequently to the formation of matter, is not easily determined. Care should be taken not to confound psoas abscess with hernia and other complaints.

TREATMENT OF LUMBAR ABSCESS.

Very few patients recover from this disease under any circumstances, and those that escape remain puny and debilitated. In the early stages it may relieve the patient, and perhaps check the progress of the disease, to employ purgatives, blood-letting, and low diet; but as soon as the formation of matter is indicated, these remedies should be laid aside, and an opposite mode of treatment adopted.

Formerly surgeons were in the habit of making a large opening in the abscess; but the ill consequences which almost invariably followed, caused the practice to be abandoned. Kirkland was among the first to state, that the patient had the best chance of getting well when the abscess opened spontaneously,

and the matter drained gently off through a very small aperture: and it was probably a suggestion of this kind which led Mr. Abernethy to propose a *small* and *valvular* opening—a practice which experience proves to be generally more successful than any other. It is stated by Mr. Pearson, however, that in comparing the result of the different modes of treatment in his own practice, a greater number of patients have recovered where the matter has been suffered to escape of its own accord.

Crowther has recorded four or five cases, which, without discharging the matter, he succeeded in curing, by means of *large blisters* over the swelling, kept open for a considerable time by the *savin* cerate. A similar plan should always be tried, and, if ineffectual, the operation recommended by Mr. Abernethy ought, I conceive, to be preferred to any other. This consists in making an opening at the most pointed part of the tumour with a common lancet, barely sufficient to permit the escape of flocculi or lumps of coagulated blood, which are apt to collect within the cyst, drawing off a small quantity of matter, and then healing the orifice by the first intention. In a week or two, or when the matter collects again in sufficient quantity, the operation must be repeated, and performed afterwards as often as the case may require, always taking especial care to close the opening after each puncture, with sticking-plaster. By draining off the matter in this gradual way, the sides of the upper part of the cyst coalesce, in proportion as the contents settle towards the bottom, until the cavity is entirely obliterated and a cure effected. Lime-water injections have been extolled by Doctor A. Hutchison.

See Kirkland's Medical Surgery, vol. ii. p. 199; Pearson's Principles of Surgery, p. 102; Abernethy's Surgical Works, 1819, vol. ii. p. 132; Crowther's Practical Observations on the Diseases of the Joints, p. 204; Lizar's case of Double Psoas Abscess, in Edin. Med. and Surg. Journ., No. lxxxiv.

SECTION V.

FEMORAL ABSCESS.

I HAVE met with several cases of deep-seated, purulent collections under the *fascia lata* of the thigh, where the disease has assumed a regular form, attended with uniform symptoms. Similar cases are mentioned occasionally, but the disease is not treated of by systematic writers. Children from six to twelve years of age, so far as my observation extends, are more subject to this complaint than others. There is always pain extending from the top of the thigh down to the knee, and generally in the course of the rectus muscle, so much resembling rheumatism that it is commonly mistaken for that disease. To relieve the pain, the patient bends the thigh on the pelvis and the leg on the thigh, and in this position the limb is constantly kept. More or less swelling is soon perceived. This is extremely hard and unyielding, and for the most part is situated a little above the middle of the thigh. The pain increases with the swelling, and in the advanced stages of the disease is so extremely severe, that the patient finds it impossible to sleep even under very large doses of opium. The constitutional symptoms also run very high, and in a little time a complete hectic is formed. The thigh continues to swell, and eventually the tumour often extends beyond the knee. A very large quantity of matter may accumulate beneath the fascia, without any perceptible fluctuation being evident, owing to the dense and unyielding structure of that membrane, which does not take on ulceration, but opposes the progress of the abscess towards the surface so effectually, that in one case to which I was called, after the disease had existed for three months, the matter had travelled along the leg and been discharged near the ankle—leaving the muscles of the whole limb completely dissected, and the patient so reduced as scarcely to be alive. Care must be taken not to confound this disease with psoas abscess.

TREATMENT OF FEMORAL ABSCESS.

In the commencement of this disease I have usually resorted to blisters, frequently repeated or kept open for a week or ten days by savin cerate. Sometimes I have established a large issue in the most prominent part of the tumour; and under these modes of treatment the matter has not formed, or has been dispersed in a short time. But, in most instances, before the surgeon is called, the thigh is so completely filled with pus, that nothing less than an operation will answer. Kirkland, who has slightly noticed this affection, seems to recommend an incision on the outside of the thigh, throughout its whole length; while Sir Charles Bell condemns a large opening as likely to produce most violent symptoms, and even death. In all the cases which have fallen under my care requiring an operation, I have pushed a common-sized lancet into the thigh through the fascia, when the matter has immediately followed, to the great relief of the patient. After this I have introduced a tent into the opening, and bandaged the whole limb as firmly as could be borne. Notwithstanding this treatment, large quantities of matter have continued to be secreted for some time, and in a few instances a fistula has remained, and could only be cured by strong injections and a tight roller.

See Kirkland's Medical Surgery, vol. ii. p. 268; Charles Bell's Operative Surgery, vol. i. p. 2.

SECTION VI.

PARONYCHIA OR WHITLOW.

THIS is a very common and frequently a most severe affection, commencing in the extremities of the fingers, in the form of a small abscess, and sometimes extending gradually upwards so as to involve the hand and forearm. The toes also are not entirely

exempt from the disease. Authors have enumerated several species of whitlow, though it appears to me without much propriety. There are certainly varieties of the complaint, but most of them originating perhaps from the same cause, and differing only in situation. Most writers describe four species, the first of which is said to be seated under the cuticle, near the root or side of the nail,—the second, in the cellular membrane, under the cutis,—the third, in the theca, or sheath of the flexor tendons, about the fingers, hand, or forearm—and the fourth, in the periosteum, or between the periosteum and bone. Even these distinctions, however, are in a great measure arbitrary; for it is not always in the power of any surgeon to declare, from examination of the part, what particular texture is affected. So far as I have observed, indeed, the symptoms are nearly the same in all cases; more severe in some than others; especially when the pus travels along the sheath of the tendons up the forearm.

In ordinary cases a pungent, deep-seated pain is felt in the end of the finger, which is soon succeeded by considerable swelling. The pain increases with great rapidity, and in a little time becomes so intolerable, that the patient is kept awake in some instances for whole days and nights together. Indeed, instances are recorded of delirium and even death from this apparently trivial complaint. Although the inflammation is rapid in its progress, and attains an enormous height, yet the suppurative process goes on tardily, so much so that weeks not unfrequently elapse before fluctuation can be perceived: and even after the pus has accumulated, it is so confined by fasciæ and tendinous sheaths, as to render its escape almost impossible, and its diffusion internally inevitable. On this account we very often find the bones bathed in matter and rendered carious, and the tendons and muscles separated from each other and completely undermined. Sometimes the ravages of the disease do not extend beyond a single phalanx; at other times the whole finger is destroyed, and several of the contiguous joints in succession.

Paronychia may be traced generally to some local injury: such as pricking the finger with a needle or splinter. Persons engaged in such occupations as require frequent immersion of the hands in warm water and other fluids, are very subject to it. Often its cause is perfectly unintelligible.

Mr. Pearson has described what he calls the *venereal paronychia*, and Mr. Wardrop has given a detailed account of a

particular disease under the title of *onychia maligna*. How far this last differs in reality from ordinary whitlow remains to be proved.

TREATMENT OF PARONYCHIA.

Venesection, both general and topical, may be required in the early stages of whitlow; leeches, especially, prove very serviceable in all cases, by abating pain and reducing the inflammation. These remedies, however, are seldom sufficient to procure resolution; but this has often been accomplished by the early and repeated application of a *blister*. On the other hand, it must be stated, that many patients derive no advantage whatever from the blister; though the same applications, I have observed, produce very opposite effects on different patients; thus I have known common linseed oil, spread over a whitlow, afford instantaneous relief in some cases—and in others, so far from proving beneficial, aggravate all the symptoms. Soft soap or common brown soap, warmed and applied to the affected part, occasionally acts in a wonderful manner—assuaging the pain and subduing the swelling in a very short time. Poultices sometimes give relief, and are useful always in softening the skin and removing tension, but when the swelling is very great, the pain intense, and matter evidently formed, the most effectual mode of easing the patient is to lay open the part freely with the knife. From the wound a large and painful fungus is apt afterwards to arise, and the same happens after a spontaneous opening of the abscess. In either case its growth must be repressed by lunar caustic and other escharotics. *Opium* given in repeated doses is essential during the height of the pain. After the matter has ceased to flow copiously, and the inflammation has subsided, the sores may be dressed with lint and mild ointments. Any portion of carious bone may be picked away cautiously. Amputation is seldom necessary in this complaint, inasmuch as the phalanges of the fingers separate spontaneously at the joints, which when the disease is arrested, heal up and form an appropriate stump. When matter collects in the hand and forearm, several different openings will be required.

For the removal of the *onychia maligna*, Mr. Wardrop recommends the evulsion of the nail, and subsequent application of

caustic. Mercury, in small doses, was found by that gentleman occasionally useful. Powdered nutgall has been used successfully by Dr. W. D. Brincklé, of this city, in cases of onychia maligna. When these remedies fail, amputation becomes necessary. The venereal paronychia is treated by Mr. Pearson, in the incipient stage, by no external applications, the part being merely covered with a fine linen rag. After the matter is discharged spontaneously, equal parts of balsam of copaiba and thebaic tincture prove serviceable.

See Pearson's Principles of Surgery, p. 87; Wardrop on Onychia Maligna, in Medico-Chirurgical Transactions, vol. v. p. 135; Dorsey's Surgery, vol. ii. p. 292; Lizar's Practical Surgery, p. 69, Edinburgh, 1838.

CHAPTER V.

ULCERS.

THERE is no class of surgical diseases in which the student should feel a more lively interest than that of ulcers—both in a pathological and practical point of view. In the one case, he has fair opportunity to speculate upon the important processes of animal decay and reparation; in the other, to exert his utmost ingenuity to overcome difficulties which the best surgeons in every age have felt and acknowledged—the obstinate, and oftentimes intractable nature of the complaint. Strange as it may appear, however, so little attention is paid by most students to this department of surgery, that it is hardly possible for the prescribing surgeons, or clinical lecturers, in the Philadelphia Hospital, to interest a class by any observations they may make on the subject or by any cases they can exhibit. But this feeling, amounting almost to prejudice and disgust, is not peculiar to the members of the profession in this country; it is noticed and complained of every where, and arises, doubtless, from the loathsome condition in which ulcers are generally found—such diseases being most common among the lower orders of people, especially the intemperate and filthy. There is another reason, too, I am convinced, which has had great influence in preventing that attention to ulcers they deserve—the unsatisfactory, complicated, and adverse distinctions made by almost every writer. This is so conspicuously the case, that the student can hardly take up any common treatise on the subject without finding himself immediately involved in a labyrinth of perplexities; and if he proceed so far as to understand, as he supposes, the views of the writer, and attempts to apply them to practice, all his conceptions vanish in a moment, and he only knows that there is an ulcer before him without being able to say to what class or species it belongs. This confusion, it appears to me, has arisen from the numerous appellations given by authors to ulcers of the

same character, and from very trifling and oftentimes accidental varieties being dignified with the name of *species*. Thus the *simple purulent* ulcer, and the *simple vitiated* ulcer of Mr. Benjamin Bell, are the *healthy* and *irritable* ulcers of Sir Everard Home. Again—what Sir Everard Home describes as an “*ulcer in parts too weak to carry on the actions necessary for its recovery*,” is called by Mr. Burns the *overacting* ulcer, and by common writers the *fungous* ulcer. The name of *inflamed* ulcer has sometimes been substituted for *irritable* ulcer, and *callous* ulcer for that of *indolent* ulcer. These contrarieties, however, are pardonable and unimportant compared with others which have been adopted almost universally—such as the *sinuous* ulcer, the *carious* ulcer, the *fungous* ulcer, the *sloughing* ulcer. These, it must be evident to any practitioner much accustomed to the treatment of ulcers, are accidental symptoms merely, or, at farthest, variations which are not peculiar to any particular species, but may accompany or follow all.

After these remarks, it will be proper to attempt a classification of ulcers calculated to obviate the objections that have been urged. This may perhaps be accomplished by an arrangement approaching to that of Home, but differing from it chiefly in being more simple and intelligible. With this view, I shall arrange all ulcers under three classes—*healthy*, *unhealthy*, and *specific* ulcers. The first class comprehends but one species; this I shall call the *simple* ulcer. The second contains two species—the *irritable* and *indolent* ulcer. Under the third class may be arranged several species, the principal of which are ulcers from scrofula, cancer, fungus hæmatodes, and syphilis. To these might be added perhaps with propriety, the *syphiloid*, *scorbutic*, *herpetic*, and *contagious** ulcer. The ulceration that attends *lupus* or that particular disease called *noli me tangere*, may also rank as a species of specific ulcer.

* Usually denominated Hospital Gangrene.

SECTION I.

SIMPLE ULCER.

THE simple ulcer is the result of some injury done to a sound part, by a wound, contusion, abscess, or burn. It is generally met with in young and healthy subjects, and may occupy any part of the body. The surface of this ulcer exhibits a florid appearance, owing to the small, pointed and numerous bright red granulations, which cover it in every direction. In a little time small white patches may be observed, on the top of these granulations, first near the edge of the old skin, and afterwards in the middle and other parts of the sore. These lay the foundation of a new cuticle. From the sore there is always discharged a white, thick, inodorous pus, small in quantity and easily wiped away. Provided the constitution remains sound, and no additional injury is sustained by the ulcer, it will generally heal in a very short time; but it is possible for such an ulcer to become diseased, and then, according to circumstances, it may take on the irritable or indolent character.

TREATMENT OF THE SIMPLE ULCER.

As the natural tendency of this ulcer is salutary, the only remedies required are such as will defend it from external injury and prevent evaporation of the pus. Keeping the patient in a horizontal position, if it be an ulcer of the leg or foot, elevating the limb upon a pillow or moderately inclined plane to facilitate the return of blood, and barely covering the sore with some mild and fresh ointment spread on lint or on a fine linen rag, will often effect a cure in a few days. The simple ointment and Turner's cerate I have found the most useful. Dry lint is an excellent application in most ulcers of this description. It should not cover the whole sore, but chiefly its centre—the edges being protected by small slips of linen spread with cerate. Some patients complain of dry lint, as too stimulating and adhering so closely to the granulations as not to be removed without giving pain. In such cases I have usually found a cold bread and milk poultice a very soothing and useful application. Sir Everard Home condemns the employment of poultices altogether in this species

of ulcer. Few ulcers of the simple species will bear pressure either from a roller or adhesive straps. In some particular constitutions, applications which keep the surface of the sore moist do mischief; in these cases, the ulcer will often heal by exposing it to the air and permitting it to form a scab. Mr. Liston, however, is a strong advocate for simple aqueous dressing in most ulcers, especially those of the healthy kind, and the other surgeons of the North London Hospital have adopted his views. Two or three grains of sulphate of zinc are occasionally added to the water, when the granulations require to be stimulated. Higginbottom, in certain cases of simple ulcer, commends the *argentum nitratum* and gold-beater's skin.

SECTION II.

IRRITABLE ULCER.

THE irritable ulcer is the first species of the class of unhealthy ulcers, and is generally characterized by the following appearances and symptoms. The edges of the sore are ragged, undermined, and sometimes almost serrated. The parts for some distance beyond the ulcer are red and inflamed, and often œdematous. Irregular hollows occupy the bottom of the ulcer, and contain a thin, greenish or reddish matter, which is so extremely acrid as to excoriate the adjoining skin. In place of granulations may be found a white or dark red spongy mass, extremely painful and shedding blood upon the slightest touch.

Although the irritable ulcer generally proceeds from local causes, it is influenced, in most instances, materially, by the state of the constitution and habits of the patient. The digestive organs, in particular, as I have often witnessed, are very apt to be disordered in persons afflicted with the irritable ulcer, whether primarily or secondarily cannot always be ascertained. Commonly also this ulcer is met with in persons of nervous or irritable temperament. Hence the disease is by no means unfrequent in the higher classes of society, particularly amongst epicures,

huge feeders, and debauchees. When seated in the leg, as usually happens, the patients suffer immensely from pain, which is most severe at night, and sometimes attended with spasms of the limb. Irritable ulcers are generally situated on the fibula, immediately above the ankle, where, without penetrating far, they soon expose the bone, and quickly render it carious if not arrested by appropriate remedies. The *sloughing* ulcer sometimes partakes of the character of the irritable variety. It occurs in bad constitutions, especially those reduced by intemperance and want. The edges of the sore are livid, its surface dry and covered with small vesicles.

TREATMENT OF THE IRRITABLE ULCER.

When we have reason to believe that an irritable ulcer proceeds from, or is kept up by, some derangement of the digestive organs, immediate recourse must be had to steady purging and nauseating doses of antimonials. It is astonishing how much may be done for local diseases in this way, and for foul irritable ulcers especially. I am very sure, from considerable experience in this branch of surgery, that more benefit is to be derived in many cases from a few doses of medicine judiciously administered, than from all the local applications that can be thought of. I cannot, however, speak in the same terms of blood-letting, which some have highly recommended; indeed, very few cases of irritable ulcer have fallen under my notice requiring this operation.

As most patients among the lower orders come into hospitals and alms-houses with their ulcers inflamed and in a very foul state, the best local application to begin with is a *warm poultice*, just large enough to cover the sore, and not so large as by its weight to create pain. Much will depend upon the condition of the ulcer as regards the continuance of the poultice. Generally the patient's pain is soon relieved by the application, and the ulcer improves rapidly under it. But in four or five days the surgeon will find it expedient, in most cases, to lay it aside and substitute some other dressing. As long, however, as the poultice agrees with the ulcer it should be continued, even until cicatrization is completed. The carrot often forms an excellent poultice for the irritable ulcer. It should be finely grated and

applied in a raw state, or boiled to a soft pulp. The powder of the bark of slippery elm, made into a jelly by boiling water being added to it, agrees remarkably with the irritable and most other ulcers.

Fomentations are highly extolled by some writers, but the difficulty of application renders them almost useless. Unctuous substances disagree with the irritable ulcer, except the materials be extremely mild and perfectly fresh. Sir Everard Home highly praises common cream in those irritable ulcers with which warm applications disagree. After the sensibility of the ulcer has diminished, a weak solution of the *argentum nitratum* will be found one of the best applications that can be employed. Opium given internally, mixed with poultices, or sprinkled in the form of powder over the sore, is well adapted to remove pain, and is frequently indispensable. The elevated position of the limb, and perfect rest are essential in this species of ulcer. Every thing like pressure and bandaging must be avoided.

Sir Astley Cooper commends the application of equal parts of mild mercurial and spermaceti ointments mixed with a small portion of pulverized opium for most irritable ulcers; and I can confidently confirm his statements. Calomel and opium, internally, are also highly praised by the same authority.

For the *sloughing* irritable ulcer, there is nothing better than diluted nitric acid—fifty drops to a quart of *distilled* water. It has the singular effect of giving to the sore, in a few days, a bright scarlet tint, and produces altogether a different impression from that of the *undiluted* acid. Carbonate of ammonia, tincture of opium, and camphor mixture, combined, and internally administered, have been found extremely serviceable in the same variety of ulcer. For our knowledge of these remedies we are indebted, chiefly, to Sir Astley Cooper. I may here remark, indeed, that I have found most of the applications for ulcers extolled by that eminent surgeon singularly efficacious.

SECTION III.

INDOLENT ULCER.

THE indolent is the most common of ulcers, and is almost peculiar to filthy, dissolute, and intemperate persons. It is the species of ulcer with which the wards of alms-houses and hospitals are crowded, which is so frequently seen amongst common soldiers, sailors, and people in the ordinary walks of life. From the simple and irritable ulcer it differs materially both in symptoms and external character. The granulating surface has a flat and shining aspect, and is covered partly with a pellicle or crust of a whitish or dark gray colour, so tenacious as to be inseparable from the ulcer without considerable force. Sometimes the sore is perfectly dry or free from matter, but generally there is a profuse discharge of a viscous, cohesive, fluid, intermediate between pus and coagulating lymph. The edges of the ulcer are elevated, protuberant, smooth, and rounded; hence a very deep cavity is apparently formed, when in reality the base of the ulcer is very little below the level of the sound skin. For a considerable distance beyond the ulcer the parts are swollen and indurated, and the whole limb enlarged. In nine cases out of ten the leg is the seat of the indolent ulcer, and the nearer the disease approaches the ankle, the more difficult it is to cure. So trifling is the pain in most instances, that the patient is hardly sensible of the existence of a sore.

It is possible for the simple or irritable ulcers, from neglect or bad treatment, to become indolent, and assume all the appearances just described, or the indolent ulcer may exist, from the first, independently of the others. In that case the external characters will differ, in some respects, from those pointed out as peculiar to the disease in its advanced stage. The granulations are pale, flabby, large, and rounded, bleed from the slightest scratch, and rise oftentimes in a fungous form above the level of the skin. This is what Sir Everard Home would term an "ulcer in parts too weak to carry on the actions necessary for its recovery," and what is usually denominated by writers the "*fungous ulcer*" but which, in reality, is the first stage, or at any rate a variety only of indolent ulcer. This variety may, and often does, accompany an ulcer with carious bone, sprouts from the

mouth of a sinus or covers the surface of many specific ulcers. From whatever source it springs its characters are uniform, and its disposition so truly indolent, that it cannot, without impropriety, be referred to any other head.

Another variety of the indolent, is the *varicose ulcer*, or that disease which sometimes precedes, at other times follows, a varicose enlargement of the veins of the leg and thigh. This has been looked upon by some as a particular species, but its characters in most respects are so allied to those of the common indolent ulcer, that it ought not to be placed in any other rank. The cavity of this ulcer is not unusually deep, and its bottom presents nearly the same appearance as the indolent ulcer in its advanced stage; the edges of the skin, however, bounding the sore, are not tumid. In shape the ulcer approaches to the oval, with its longer diameter vertical. The pain is not acute, but rather deep-seated and extending along the venous trunks. These trunks are distended and knotted, in some cases quite to the groin, and their branches displayed in endless tortuosities over the whole leg. The ulcer itself generally occupies the inner side of the leg.

TREATMENT OF THE INDOLENT ULCER.

When the indolent ulcer has continued for months or years, and the patient's constitution is enfeebled by disease, or worn out by intemperance, very little benefit may be expected from any mode of treatment. Almost every surgeon has met with cases of this description; and it is by no means uncommon, on the other hand, to see stout and healthy-looking patients walking about or lying in the wards of an alms-house, with one or both legs covered with large and insensible sores of twenty years' standing, which have been brought at different periods almost to a close, but in a few days have broken out afresh and become as large as ever. Many such patients are to be found, in Europe especially, who nourish their diseases to gain a livelihood by begging, or to secure a permanent abode in some public charity. In this country too I have known patients to irritate their sores by picking them with pins through the bandages, in order to prevent the healing process.

As soon as an ulcer shows a disposition to become indolent, which may be known in recent cases by the rounded and fun-

gous form of the granulations, the surgeon should resort, without delay, to escharotics, adhesive straps, or the roller. Under this treatment a cure will often be accomplished in a few days. When the sore has become so truly indolent or callous, as to remain insensible under the strap and bandage, additional means should be employed. The edges must be pared away by the knife, and the whole surface pencilled with the vegetable or lunar caustics. By these means the older surgeons often succeeded after the failure of all other remedies. There are many ulcers of the leg which burrow in the cellular membrane, and spread extensively, owing to the fascia beneath them remaining entire. Such sores seldom heal until the fascia is slit up or pared away. In general, the best application to begin with, when the indolent ulcer is very foul, is a common poultice of bread and milk or linseed, followed up by an oak bark poultice, and continued two or three days. After this, adhesive straps—the leg being previously shaved—may be applied in such a way as not to encircle the whole limb, but two-thirds merely—care being taken to leave spaces for the escape of matter. Over the straps, beginning at the toes, we place with moderate firmness, a cotton, flannel, or serge roller, and continue it up the limb as high as the knee. Under this treatment, the sore improves so rapidly that the patient is frequently able to walk about and attend to his business, without the exercise interfering with the cicatrization. Experience proves that sores healed in this manner are less apt to break out again, than those cured by rest and the horizontal position. There are some patients, however, that cannot take exercise without its occasioning an increase of the ulcer; though there is reason to believe, that this arises, too frequently, from an improper or slovenly mode of applying the bandage and straps. Within the last few years considerable improvements upon Baynton's plan of using adhesive straps, have been made by Scott and others.

Many ulcers require, in addition to pressure, highly stimulating applications,—such as repeated touches with lunar caustic, savin in powder, or mixed with yellow basilicon, cantharides, capsicum, and other varieties of pepper, the gastric juice of animals, decoction of walnut leaves, nitric acid, diluted in the proportion of fifty drops to a quart of distilled water, lime-water and laudanum, unguentum hydrargyri nitrati, corrosive sublimate, camphor, chloride of soda, creosote, the carbonates, and

phosphates of iron, &c. Dr. Underwood highly extols the *black basilicon*, and represents it as infinitely more efficacious in all cases than the yellow. With some ulcers, however, milder applications answer a better purpose,—such as rhubarb in powder, either alone or combined with crude opium, tincture of myrrh, &c. The best cicatrizer, according to Dr. Physick, for most indolent ulcers, is simple cerate and British oil—an ounce of the former to two drachms of the latter to begin with, gradually increasing the quantity of the oil. But as a general rule in the treatment of all ulcers, the surgeon must not neglect to *change his dressings repeatedly*; for it has been ascertained beyond all doubt, that sores flag, and are put back for weeks, by the improper continuance of a medicine which at first and for a short time, produced excellent results.

For many years I have employed, with great advantage, at the Philadelphia Hospital, *inclined planes*, upon which the limbs of patients have been elevated and kept for weeks. For the suggestion I am indebted to the late Dr. Physick. The practice has been adopted by Liston and others in London.

Constitutional remedies often exert great influence over indolent ulcers. In the wards of the Philadelphia Hospital I have succeeded, in numerous instances, by the use of the blue pill and other preparations of mercury, after most other medicines had been tried for months ineffectually.

When the patient's constitution has been prostrated by intemperance, and other similar causes, the internal use of carbonate of ammonia, of wine, brandy, opium, &c., will prove of immense service. Indeed, in most instances of the kind, ulcers cannot be healed without the use of such remedies.

Where sinuses exist, well directed pressure by bandages will do a great deal; when these fail, the track must be laid open by the knife. Fungous granulations are easily repressed by red precipitate, blue vitriol, or adhesive straps. So long as any portion of carious bone remains, the ulcer will keep open in spite of every dressing; in these cases, the gastric juice, nitric, and other acids, often prove serviceable, by acting upon and removing the earthy parts of the bone. The surgeon should not be too officious in cutting away bones apparently carious, otherwise he will soon find all the symptoms aggravated, and the bone in a little time rendered *really* carious. Nature is generally more efficient in such cases than art.

A very troublesome form of indolent ulcer often results from *inverted toe-nail*. This may frequently be removed by the application of lunar caustic, even without removal of the nail. In other cases it is necessary to get rid of the nail either by cutting it partially or entirely away beyond its root, on the affected side, or by scraping its centre with a piece of glass as close as the patient can bear, and then notching its extremity in the shape of the letter V.

Mr. Stafford, of London, drew the attention of the profession a few years ago, to a plan somewhat novel, of curing excavated indolent ulcers. This method consists in pouring into the ulcer melted wax, composed of four parts of white wax and one of Venice turpentine, of such a temperature as will cause it to cool and become solid almost immediately upon touching the sore. It has been extensively tried, both in Europe and this country, but has, I believe, few advocates.

The ulcer accompanied by *varicose veins*, will generally heal under adhesive straps, the roller, or laced stocking; but in many instances, these veins become so large as to require an operation, without which every effort on the part of the surgeon to close the sore will prove fruitless. This operation will be described at a future period under the head of *Diseases of the Veins*.

See Underwood's Surgical Tracts, containing a Treatise upon Ulcers of the Leg, 3d edit. 1799; Whately's Practical Observations on the Cure of Wounds and Ulcers on the Legs, without Rest, 1799; Home's Practical Observations on the Treatment of Ulcers on the Legs, considered as a branch of Military Surgery, &c., 2d edit., 1801; B. Bell on the Theory and Treatment of Ulcers, in vol. ii. of System of Surgery, 7th edit. p. 214; Thomson on Inflammation, p. 423; Roux's Narrative of a Journey to London in 1814—or, a Parallel of the English and French Surgery, 2d edit., 1816, p. 127; The Lectures of Sir Astley Cooper, by Tyrrel, vol. i.; Stafford's Essay on the Treatment of the deep and excavated Ulcer, 8vo. London, 1829; Liston's Practical Surgery.

CHAPTER VI.

SPECIFIC DISEASES.

UNDER this head I propose to arrange certain diseases which, it appears to me cannot be treated of with propriety in any other place, inasmuch as they are closely connected with inflammation and its terminations, and with other subjects discussed in the foregoing pages. Some of these diseases may appear, perhaps, to belong to the practice of medicine. In a limited point of view this is really true; but it is equally obvious, that a large share of their pathology and treatment must come within the surgical department. Besides scrofula, cancer, fungus hæmatodes and syphilis, there are specific affections not so obtrusive to the senses, but sometimes equally formidable and not less difficult to cure.



SECTION I.

SCROFULA.

WITHOUT attempting to explain or reconcile, in this place, the discordant, multifarious, and too often wild and hypothetical views regarding the nature of scrofula, it may be sufficient to state that we know very little of its origin, of the circumstances respectively calculated to modify the forms and variations under which it appears in the different textures of the body, or of the method of cure. We are perfectly familiar, however, with its effects both constitutional and local, and with the symptoms by which it is characterized.

In most instances, certain premonitory signs, noticed by all

writers, are very perceptible, long before the disease itself becomes evident. The complexion is extremely delicate, of a lively red colour mixed with a beautiful white, and the red of the lips approaches to a carnation tint; but the lips themselves, the upper especially, are thick and protuberant. The pupils of the eyes are dilated, and the conjunctiva remarkably clear and free from vessels. The eyelids droop unnaturally, and give to the countenance a melancholy but interesting expression. The head is large and protuberant at the occiput, the neck short, the lower jaw thick and fleshy, the eyes of a light gray or blue colour, the belly swollen and prominent. These signs, taken collectively, undoubtedly manifest the scrofulous constitution; but some of them are at least equivocal, such as the colour of the eyes, which are, perhaps, as often dark as light, and in some instances extremely black. The hair is generally straight and wiry, and often of a jet black colour. Sometimes, however, it is almost white.

Children are more subject to scrofula than grown persons, and the disease may show itself at any period between infancy and puberty; it may appear also in almost any texture of the body, and is certainly not, as some authors have imagined, peculiar to the lymphatic absorbent system. But the lymphatic glands undoubtedly are more susceptible of the disease than other parts, especially the glands of the neck and mesentery. Next to these the lungs and spongy parts of the bones are most apt to suffer.

In whatever situation a scrofulous tumour may be met with, it uniformly exhibits the following appearances and symptoms. At first there is simple enlargement without pain or unnatural heat; in a short time, however, the patient complains, if the tumour be pressed upon, and the warmth of the part is sensibly augmented by several degrees. In this state, or without any material change, the disease may continue for months or years, and afterwards disappear spontaneously. Commonly it follows a different course—gradually taking on inflammation, and at last terminating in abscess and ulceration. Long before the abscess breaks, the skin assumes a dark purple or leaden colour, and retains it in many instances for a considerable time, after the sore has cicatrized. The matter discharged from the abscess is thin, gleety, and mixed with flocculi or small portions of a substance resembling cheese. The discharge sometimes continues for many

weeks; in other instances, the openings from which it is poured out rapidly enlarge, and the whole tumour, or its remnant, is converted into an ulcer peculiar in appearance and difficult to cure. When a scrofulous abscess follows an enlargement of a lymphatic gland, it might be supposed that the matter was formed within the substance of the gland; this, however, is not invariably the case—the gland sometimes remaining entire, and the matter having only formed around it. This particular state is ascertained by the probe, by the circumstance of the tumour undergoing no diminution, and occasionally by the separation and evacuation of the unaltered gland itself. Scrofulous abscesses of large size seldom proceed from a single gland, but from a cluster of glands united by inflammation. When such enlarged masses are seated in the neck, they sometimes, by pressure, impede respiration and deglutition.

The scrofulous *ulcer* usually puts on the following appearances. The edges are thin, smooth, obtuse, of a pale red or purple hue, and overhang the ulcer, the bottom of which is deep and the granulations loose, indistinct, of a faint rose colour and glossy aspect. From the sore is discharged a thin curdled, colourless, offensive matter. This ulcer is never painful, unless inflamed by rude treatment, improper applications, or carious bones; in that case, the whole surface is changed, becomes of a fiery red colour, accompanied by fungous granulations, elevated and re-torted edges, and a profuse discharge of watery matter.

Although the nature of scrofula is involved in great obscurity, there are certain occasional causes which appear to exert considerable influence in bringing the disease into action. These are particular degrees of cold, especially when conjoined with moisture, irregularities of diet, meagre and unwholesome provisions, an impure or tainted atmosphere generated in crowded manufactories, hospitals and schools, deficient clothing, external injuries, fevers, mercurial frictions, want of exercise, filth, fatigue, mental anxiety, &c. Of all these causes, a cold, damp and variable climate is the most powerful in inducing the disease; and next to this, perhaps, derangement of the digestive organs, from improper and particular modes of living. It is well known that Mr. Abernethy, within the last few years, has endeavoured to show by a variety of illustrations that a great many local diseases derive their origin from disorder of the digestive functions. The same train of reasoning has been applied by Carmichael

and Lloyd to the explanation of scrofula, and it appears to me, with very considerable success. With regard to the hereditary or adventitious origin of scrofula, much diversity of opinion still prevails: it seems to me, however, that the advocates of each side of the question have chiefly erred in admitting the influence of one to the entire exclusion of the other. I have no hesitation in stating that I believe in the hereditary transmission of scrofula, and am at the same time fully persuaded that it may take place in a perfectly healthy constitution when exposed to the influence of the different occasional causes above enumerated.

TREATMENT OF SCROFULA.

There can be no stronger proof of the difficulty of curing scrofula, than the circumstance of the immense number of articles offered at different periods, as constitutional, specific, and local remedies—such as bark, mercury, antimony, cicuta, hyosciamus, belladonna, opium, dulcamara, aconitum, cold and warm bathing, mineral-waters, &c.; all of which, and many more, have been highly extolled by some writers, and as pointedly condemned by others. I believe, however, that it is now generally acknowledged that these means, when they do prove serviceable, only act by invigorating the system or by keeping the stomach and bowels loose and free from acidity. If so, a sufficient hint is furnished the practitioner to select those articles best calculated to produce such effects, without incommoding the patient by imparting too much tone, or prostrating him unnecessarily by profuse evacuations. With this view, small doses of mild purgatives, such as magnesia, rhubarb, sulphur, castor oil, and the blue pill, should be prescribed occasionally. Without a strict regard to diet, however, these purgatives will answer very little purpose. It must not be understood that the patient is to live scantily, and on very meagre nutriment; on the contrary, his system should be supported by a light and moderately nourishing diet, consisting chiefly of plain animal food, and such other articles as the stomach can easily digest. Conjoined with this treatment, tonics, particularly bark, used alone or combined with the preparations of iron, the tincture of iodine, a decoction of sarsaparilla or of althæa, an infusion of cascarilla, a change of climate, or removal from a cold and damp to a dry and warm situation, flannel next to the skin—covering the extremities as

well as the body—and other warm clothing, together with moderate exercise, will do more for the patient, perhaps, than all the reputed specifics ever imagined.

Scrofulous *tumours* or abscesses are seldom benefited by local applications; when very large and indolent, blisters, stimulating liniments, frictions, and issues have been used with advantage. The older surgeons often extirpated indurated scrofulous glands, and according to their own accounts with success. Such an operation, however, can very rarely, if ever, prove necessary.

For the scrofulous *ulcer* many different applications have been recommended. The best, I conceive, are dry lint, mild ointments, the iodine cataplasm, slightly astringent washes and moderate pressure. If the sore should become indolent, the black basilicon, nitrate of silver, and other remedies formerly recommended for the common indolent ulcer, may be required. Dupuytren has used in obstinate scrofulous ulcerations, a powder composed of one hundred and ninety-nine parts of calomel to one of white arsenic, and with very considerable benefit.

See White on Struma; Burns' Dissertations on Inflammation, vol. ii. p. 145, edit. 1812; Hamilton's (of Lynn Regis Hospital) Observations on Scrofulous Affections; Russel on Scrofula, 1808; Thomson on Inflammation; Carmichael's Essay on the Nature of Scrofula with Evidence of its Origin from Disorder of the Digestive Organs, 1810; Lloyd's Treatise on the Nature and Treatment of Scrofula—describing its connexion with Diseases of the Spine, Joints, Eyes, Glands, &c. 1821; Alibert's Nosologie Naturelle, ou les Maladies du corps Humain distribuées par Familles, tom. i. p. 441; Henning's Critical Inquiry into the Pathology of Scrofula, 1815; Goodlad's Practical Essay on the Diseases of the Vessels and Glands of the Absorbent System, 1814; J. G. A. Lugol Trois Mem. sur l'Emploi de l'Iodene, dans les Maladies Scrofulousés, Paris, 1832; Carswell's Illustrations of Elementary Forms of Disease, Fascic. 1.

SECTION II.

CANCER.

NOTWITHSTANDING the numerous treatises on cancer within the last forty years, and the great encouragements held out by societies for investigating its nature and treatment, we are now almost as much in the dark concerning the disease, as at any former period. All that can be done under these circumstances, is to point out in a general way, the symptoms and appearances which, according to the best writers, constitute the disease, and to notice such remedies only as are acknowledged to possess some efficacy.

By the term *scirrhus*, which is usually considered the forerunner of cancer, is understood a preternatural density or induration of the soft parts, not easily resolved, and very prone to ulceration. Besides these characters, genuine scirrhus is designated by certain external marks, and by a peculiar internal structure. The whole tumour is unequal on the surface, uncommonly heavy, and the skin covering it puckered and of a faint bluish or leaden hue. The pain also is vehement and of a peculiar kind—at first prurient, but afterwards lancinating, and compared by many patients to the gnawing of an animal. In a longer or shorter time, the tumour is apt to form adhesions with the integuments above, and the muscles below. In this condition the disease may remain for months or years without material alteration, but eventually the skin cracks in one or more places, and from the fissures is discharged a thin acrimonious and fetid matter, which excoriates the adjoining parts, and hurries on the ulcerative and sloughing process. Not unfrequently a large cavity is produced, as it were, suddenly, from the whole surface of which there is an immoderate discharge of bloody, ill-conditioned matter, in smell approaching to ammonia. This cavity is rapidly filled up by a hard, irregular, fungous mass, which protrudes beyond the edges of the sore, and often bleeds profusely of its own accord, or from the slightest irritation. Around the ulcer thus formed, the skin continues of a purple colour, and its edges remain extremely hard. The surface of the sore is of a dark red colour, and has a peculiar glossy lustre.

The margins are elevated, everted, and irregularly serrated. Many patients are worn out by irritation and hectic soon after the tumour takes on the ulcerative action; others live for years—the ulcer proving apparently so far beneficial as to arrest temporarily the extension of the disease.

When examined by *dissection* the scirrhus tumour exhibits the following appearances. In the early stage a small, very compact, and central nucleus is found, resembling cartilage in consistence, from which radiated and narrow bands proceed in irregular lines towards the circumference of the tumour. These bands are intersected transversely by others of a fainter appearance, and conjointly form a plexus or net-work which encloses a softer and more pulpy substance. However, as the tumour advances towards ulceration, these variations of structure become less distinct and are finally blended together, or else the pulpy matter is converted into a dark fluid of a greenish cast, or of a jet black colour, and enclosed in cysts formed of the radiated bands. Sometimes these cysts are filled with a perfectly pellucid fluid, are of different sizes, extremely numerous, and resemble exactly the common hydatid. According to Burns, these cavities are never absent, and are to be considered the most certain evidence of the existence of scirrhus. When the scirrhus tumour is recently removed from the body, and the transparent cyst opened with a needle, the fluid immediately spurts out to a considerable distance, owing apparently to a contractile power in the cyst itself. Such effects have been witnessed by different surgeons, and remarkable instances of the kind are recorded by Le Dran, Carmichael, and others.

It is not yet ascertained in what particular texture of the body cancer originates, or whether it be confined indeed to any texture. According to Pearson, the disease seldom, if ever, commences in an absorbent gland. It is still also a disputed point, whether cancer be a local or constitutional disease. There is so much evidence, however, now extant in favour of the former position as to leave very little doubt on the subject, and indeed to render it very questionable whether cancer ever becomes, strictly speaking, a constitutional affection. Some surgeons entertain the belief that cancer is an hereditary disease, and cases now and then occur which seem to favour such an idea. In a highly respectable family of North Carolina, the disease has occurred in four sisters, and in all the mamma was the seat of

it. The two eldest was operated on in that State, the disease returned and both died. From the third—(Mrs. General G.)—I removed the breast sixteen years ago, and there has been no return. The fourth*—(Mrs. H.)—I performed the operation on in October, 1835, with every prospect of success, though the operation was the most extensive and difficult I have ever performed or witnessed for that disease. Sir Astley Cooper and other writers, have recorded similar examples of the disease being thus met with in individuals of the same family.

As regards the *immediate* cause of cancer, innumerable hypotheses have been framed. That which approaches nearest to truth, it seems to me, ascribes the disease to animalcular origin, or, as contended by Adams and Carmichael, to the presence of hydatids—thus giving to cancer an independent vitality. This theory will not appear so absurd as some have imagined, when it is recollected that many cutaneous diseases, especially itch, arise beyond all doubt from insects which may be distinctly seen by the eye or microscope,—that worms are found in the liver, urinary bladder, arteries, veins, among the humours of the eye, and in many other situations where their presence is little suspected. The *exciting* causes of cancer are often sufficiently manifest. In many instances the disease may be traced to a blow or some other external injury, by which the organization is altered and a predisposition given to morbid action, or, in other words, such a condition of the part brought about as to afford a nidus particularly suited to the lodgement and growth of independent beings.†

TREATMENT OF CANCER.

It is now generally acknowledged that internal medicines are incapable of removing cancerous complaints, however beneficial certain articles may prove in arresting their progress and in relieving pain. The same observations will apply, with few exceptions, to all local applications. Without recounting, therefore, the numerous specifics proposed at different periods, it may be observed that by rigid abstinence, or a close confinement to a very low vegetable diet, amounting to little more than bread

* Since dead.

† See Carmichael on Cancer, p. 283.

and water, and that in quantity barely sufficient to sustain life, scirrhus and cancerous tumours have been reduced to so small a compass as scarcely to be perceptible; but the moment the patients have relapsed into their former modes of living, all the symptoms have returned, and often in an aggravated form. There are few patients, at any rate, courageous enough to encounter such a system, or sustain it long enough to produce even temporary relief. With regard to local remedies, experience demonstrates that such only can be relied on as will eradicate every particle of the scirrhus or cancerous mass, and that the *knife* only, or very *active caustics*, are sufficient to accomplish this purpose, but often fail from unskilfulness or the advanced stage of the disease. These sentiments, I believe, will accord with those of the most experienced members of the profession; but it is proper at the same time to state, that within a few years past my friend Mr. Carmichael of Dublin, a most distinguished surgeon, who has enjoyed ample opportunities of treating cancerous diseases, variously situated, and in different stages, unreservedly declares that he has effected complete cures by *ferruginous* and *arsenical* preparations. Hitherto this practice has not been pursued to any extent in the United States; but it emanates from authority so deservedly high as to entitle it justly to a full trial.

It may be well, also, to remark, that an escharotic of considerable power, and free from the inconvenience and danger of arsenic, has been extensively employed, within the last few years, in the removal of incipient or local cancer. I allude to the *chloride of zinc*, an article successfully used by Canquoin, Roifrey, Ure, Crosse of Norwich, and in this country, in several instances, by Dr. Ashmead, an intelligent surgeon of Philadelphia. There are several preparations of the kind, and two or three modes of using them. That employed by Canquoin, is composed of two parts of chloride of lime and one of chloride of zinc mixed with paste of wheaten flour and applied to the part, the cuticle of which has been previously removed by a blister. Dr. Ure objects to the French formula, upon the ground of its activity being diminished by the gluten of the dough, and remarks that the anhydrous gypsum of his formula, "while it can exercise no chemical action upon the chloride, forms a porous medium, through which the whole of the particles of the dilutescent chloride may transude upon the morbid albuminous tissue, with

the effect of decomposing or destroying it, with certainty, to any definite depth." In a few instances I have tried the French preparation at the Philadelphia Hospital upon indolent and malignant tumours, and generally with manifest improvement in the appearance of the sores—but without permanent effect.

See Pearson's Practical Observations on Cancerous Complaints, 8vo. 1793; Home's Observations on Cancer, connected with Histories of the Disease, 8vo. 1805; Johnston's Practical Essay on Cancer, being the substance of Observations to which the annual prize for 1808 was adjudged by the Royal College of Surgeons of London, 8vo. 1811; Carmichael's Essay on the Effects of Carbonate and other Preparations of Iron upon Cancer, with an Inquiry into the Nature of that and other Diseases to which it bears a relation, 8vo. 1809, 2d edit.; Lambe's Reports on the Effects of a Peculiar Regimen on Scirrhus Tumours and Cancerous Ulcers, 8vo. 1815; Burns' Dissertations on Inflammation, vol. ii. p. 177; Adams on Morbid Poisons; Neale on Animate Contagion, London, 1831; Canquoin Mem. sur un Nouveau Mode de Traitement des Affections Cancéreuses, Paris, 1835; Roifrey, New Treatment of Malignant Diseases and Cancer, London, 1836; Ure, in London Med. Gazette, 1836; J. G. Crosse, in Provin. Med. Trans., vol. v.; Hodgkin on Adventitious Structures; &c. in Med. Chir. Trans., vol. xv.; Carswell's Illustrations, &c. Medical Notes and Reflections, by Henry Holland, M. D., London, 1839, p. 560, article The hypothesis of Insect life as a cause of disease.

SECTION III.

CANCER OF THE EYE.

TRUE carcinoma of the eye-ball is seldom met with, though a disease bearing considerable resemblance to it and allied to fungus hæmatodes is not unfrequent. The former occurs chiefly in old, the latter in young subjects. Formerly the two affections were confounded, and then cancer of the eye was considered almost peculiar to children under twelve years of age. Subsequent observations tend to establish the reverse.

Cancer usually commences in the anterior parts of the eye, and speedily destroys vision by involving the cornea, iris, and crystalline lens in one confused mass. The whole globe of the eye is gradually enlarged, and becomes very painful from the

distention of its coats and the inflammation which ensues. Soon afterwards the cornea gives way, and a soft, irregular, tuberculated, very vascular fungus sprouts forth, and is so luxuriant as to attain in a short time the size of a large egg or apple—projecting beyond the lids and covering a considerable portion of the cheek. The colour of the fungus varies in different cases, according to the state of inflammation—being in some of a bright red or scarlet hue, in others of a chocolate brown or deep purple cast.

So very vascular and tender is this morbid growth, that the slightest touch is sufficient to induce profuse hemorrhage, and so often does this occur spontaneously, or by ulceration, that the patient is soon reduced exceedingly low. According to Scarpa, this soft pulpy fungus becomes hard and warty before it assumes a very malignant character. The same writer expresses his belief that the disease, with the exception of the lachrymal gland, never originates in any other texture than the conjunctiva. I have met with one instance, however, in which the *caruncula lachrymalis* was primarily affected, and subsequently the globe of the eye—the disease having extended regularly from one to the other. In another case, that of a gentleman of North Carolina, who, some years ago came to Philadelphia to consult me on his disease, a tumour formed deep in the inner side of the left orbit, and after several years' growth pushed the eye forward, and so far beyond its natural limits as to create considerable deformity. A small fluctuating tumour about the size of a marble occupied the upper part of the inner canthus of the eye, and the parts all around this seemed of a stony hardness. I determined, by way of ascertaining the nature of the complaint, to cut through the orbicular muscle and penetrate towards the bottom of the orbit—taking the soft tumour as my guide. After accurate examination, this was found of a deep blue colour, resembling in appearance exactly the common fox-grape, and containing a thin fluid, like ink, but changeable when exposed to varied light. This sac and its contents being removed, a solid tumour, which served as the base of a sac, was felt at the bottom of the orbit, surrounding apparently the optic nerve, and was extremely sensible to the touch. It was evident, both to Dr. Physick, who assisted in the operation, and to myself, that no benefit would result from a further dissection, unless the globe of the eye were also removed. This was not advised, as vision,

notwithstanding the protruded state of the eye, was still perfect. The wound was therefore closed and healed by the first intention. The patient returned home, with a determination to submit at a future period to the removal of the whole contents of the orbit, should the eye be disorganized by fungus and other characteristics of cancer. About sixteen years ago, he fell, whilst walking in a field, upon a sharp-pointed tobacco stalk, which entered at the precise spot afterwards occupied by the encysted tumour; and to this circumstance he attributes his disease.*

Both eyes are seldom affected simultaneously with carcinoma, nor does it often happen that the destruction of one is followed by disease in the other.

Upon *dissection*, the cancerous eye commonly exhibits the following appearances. All the coats are very much thickened and indurated, and their interstices occupied by a whitish fibrous mass, intermixed with pulpy matter. The humours are absorbed, or so changed as not to be recognised, and their places filled up by fungus or small cysts containing a transparent fluid. Sometimes the whole cavity of the eye is distended by the same substance that is interposed between the coats. The fungus, when examined minutely, appears to be made up of cells filled with matter resembling the pulp of a decayed pear or apple. In the advanced stages of the disease, the optic nerve is thickened and discoloured often as far as its origin.

The drawing in Plate IV. affords a very striking illustration of the form and colour of the carcinomatous eye. It was taken from a woman sixty years of age, a few days before I removed from the orbit the whole diseased mass. Although previously much reduced by repeated hemorrhage, she recovered in less than a month, and never, as far as could be ascertained, had any return of the complaint, and lived many years after the operation.

TREATMENT OF CANCER OF THE EYE.

Nothing less than complete excision of the whole disorganized mass from the orbit will answer any purpose, and, unfortunately, in most instances, this operation is so long delayed that the patient's chance of recovery, after he does submit, is exceedingly diminished.

* This patient, as I have since ascertained, recovered perfectly.



The first step of the operation is to divide the tarsi at each angle of the eye by an incision half an inch in length. This enables the surgeon to separate the lids widely, and thereby to get free access to the conjunctiva and ball of the eye. As soon as the conjunctiva is divided, the ball becomes very loose and may be easily turned out. A common scalpel, rather narrow in the blade, will be found more convenient than any other instrument; and by this the whole operation may be completed. Sometimes the curved scissors will be found useful in clipping off diseased portions adhering to the lining membrane of the orbit, or in removing the lachrymal gland, which ought always to be taken away. In dividing the optic nerve, the surgeon must be careful not to pull out the eye too forcibly, lest unnecessary pain be created or injury sustained from tearing the nerve. During the dissection blood will flow copiously from the diseased mass or from individual arteries, especially the branches of the ophthalmic; these, however, seldom require the ligature, and the hemorrhage generally stops in a little time after the removal of the tumour, or is readily suppressed by lint, with which the orbit must be filled after the operation. The eye-lids should not be touched, unless they have suffered from the disease. In favourable cases, granulations sprout rapidly, and in three or four weeks fill up the orbit so completely, as not to leave more deformity than usually arises from the loss of an eye under any other circumstances. Sometimes violent inflammation follows the operation, and requires the free use of the lancet and antiphlogistic system. Mr. Guthrie, from one patient, drew two hundred and fifty ounces of blood in three days. Occasionally the inflammation extends to the brain and proves fatal.

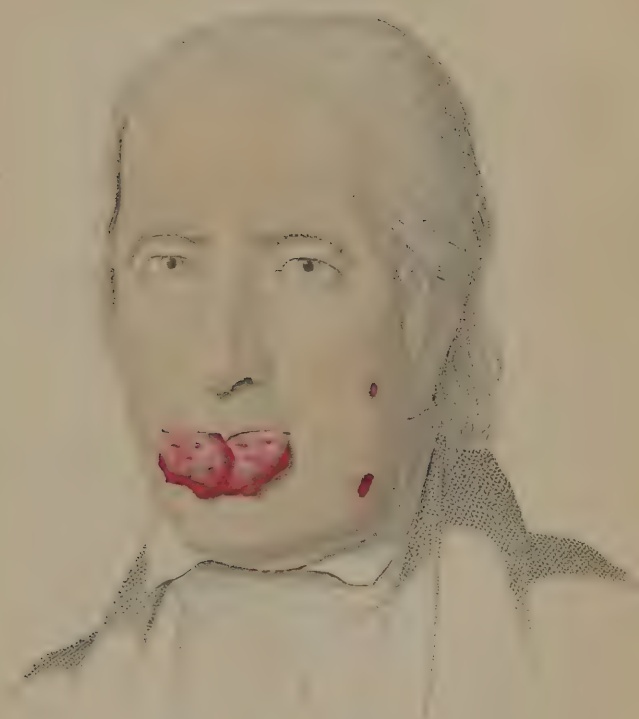
See Desault's Works, by Smith, vol. i. p. 87; also Chopart and Desault, *Traité des Maladies Chirurgicales et des Operations qui leur conviennent*, tom. i. p. 176; Wardrop on *Fungus Hæmatodes*, p. 93; Scarpa on the Eye, by Briggs, chap. xxi. 2d edit.; Travers, *Synopsis of Diseases of the Eye*; *Operative Surgery of the Eye*, by G. J. Guthrie; Middlemore on the Eye; Lawrence on the Eye; Velpeau *Nouv. Eléments de Méd. Operat.* 1839; Malgaigne, *Man. de Méd. Opér.* 1837.

SECTION IV.

CANCER OF THE LIP.

It is somewhat extraordinary that cancer rarely, if ever, attacks the upper lip, while the lower lip is frequently subject to it. The disease appears under different forms. In the commencement I have generally observed a small rounded tumour, resembling a shot both in colour and size, seated immediately beneath the skin, covering the red part of the lip, and, when pressed upon, rolling under the finger. The tumour in this state gives no pain, but if frequently handled by the patient, or otherwise irritated, grows rapidly and soon becomes fixed to the surrounding parts. In other cases, a firm and immoveable lump, of considerable size, is from the first felt deeply imbedded in the substance of the lip. This approaches the surface slowly, and at last ulcerates and throws out a prolific fungus of a dark red colour, so large as in some instances to envelop the whole mouth. A third variety of the disease is found in the form of a chocolate-coloured, warty excrescence; this never attains a large size, but is constantly casting off scabs, the place of which is speedily supplied by others. These tumours are all capable of contaminating by extension the adjoining parts of the face and neck, especially the lymphatic glands, and when this occurs there is very little hope of the patient's recovery. These glands I have known to become enormously enlarged, and to involve the muscles of the jaw, the bone, and even the soft parts about the neck. A patient about forty years of age, sent to me some years ago by Dr. Ard, an eminent physician of Huntingdon county, Pennsylvania, had one-half of the lower jaw laid bare by extensive ulceration of the lymphatic glands, and finally died in a horrible condition.

In Plate V. there is an excellent representation of cancer of the lip, accompanied by fungus and an enlargement of the lymphatic glands of the left cheek and angle of the jaw. The patient resided in Delaware county in this State, and came to Philadelphia about twenty-five years since to obtain relief; the disease, however, though not of long standing, was, from its advanced state, beyond the reach of surgery. Contrary to my advice, he placed himself under the care of a quack, who attempted to re-





move the different tumours by caustic; which, so far from proving beneficial, aggravated all the symptoms and speedily produced his death.

Venereal ulceration of the lip and *lupus* have been mistaken for cancer, and treated accordingly. The surgeon, therefore, should be strictly on his guard, and never without full investigation pronounce decisively as to the nature of the complaint, or propose an operation unless well assured of the existence of cancer. Encysted tumours, also not unfrequently occupy the substance of the lip—containing either a gelatinous or curdy matter. The small glands, moreover, often enlarge, and are mistaken for malignant disease. These may, possibly, require an operation. Such tumours, and even cancerous ones, are often caused by pipe and segar smoking, and by diseased teeth.

TREATMENT OF CANCER OF THE LIP.

Although Stark and Langenbeck have praised highly the use of arsenic in cancerous ulcers of the lip, little dependence can be placed upon it or any other remedy except the knife; and this, too, often fails from want of timely application. When determined upon, the operation may be done in the following way.

An assistant holds between the lip and gum of the patient a piece of wood about six inches long, an inch in breadth, and the eighth of an inch in thickness. Upon this the lip is spread out, and two incisions made, one on each side of the tumour, quite through a sound part of the lip, in shape of the letter V, and the diseased mass removed. If the tumour has been large and of long standing, considerable hemorrhage will follow the operation, and it may be necessary to tie several vessels. Frequently, however, the bleeding is effectually suppressed upon drawing together and placing in exact apposition the divided edges of the lip, and there retaining them by the twisted suture or by adhesive straps. In a few days the pins should be removed, when the wound will be found as firmly united as it commonly is after the operation for hare-lip.

Instead of performing the operation in the manner just described, *Richerand** has proposed to remove the whole of the

* Nouveau Procédé pour l'Extirpation des Cancers aux Levres, par M. Richerand—in *Annuaire Médico-Chirurgicale*.

diseased part with a pair of curved scissors, then to secure the vessels and merely cover the raw surface with a bit of agaric—avoiding altogether the use of pins and ligatures. A case is related by this surgeon in proof of the success of the operation. The whole of the under lip was cut away from one angle of the mouth to the other; yet in the course of a fortnight the chasm was filled up by new matter, and scarcely a vestige of disease or deformity remained. This operation was witnessed by Cloquet, Ribes, Breschet, and Beclard. Swan,* of England, has repeated this experiment of Richerand, and with a result nearly similar. Dupuytren was also in the habit of performing a similar operation.

See C. Bell's *Operative Surgery*, vol. ii. p. 33; *Dictionnaire des Sciences Médicales*, tom. xxviii. p. 74; Alibert's *Déscription des Maladies de la Peau, observées à l'Hospital Saint Louis*, fol. p. 116; Delpech's *Précis Élémentaire des Maladies Reputées Chirurgicales*, tom. iii. p. 549; Travers, in *Medico-Chirurgical Transactions*, vol. xv.; *Practical Surgery*, by Robert Liston, 3d edit. London, 1840, p. 286.

SECTION V.

CANCER OF THE TONGUE.

TUMOURS of the tongue, having all the appearance of scirrhus, frequently arise from disorder of the digestive organs, or from irritation produced by carious and ragged teeth. Sometimes also the whole tongue becomes enormously enlarged, fills up the mouth and hangs below the chin. Many cases of the kind are recorded by writers, and in particular two very remarkable ones by Percy.† The tongue is likewise studded over, in some instances, with small excrescences, having broad tops and narrow pedicles, resembling a mushroom. At other times deep fissures or irregular cracks occupy the whole surface of the tongue. But these are all different from genuine scirrhus or

* Johnson's *Medico-Chirurgical Review*, vol. iii.

† See *Dictionnaire des Sciences Médicales*, tom. xxvii. p. 246.

cancerous ulceration, known by the hard, rough, broad-bottomed, wart-like tumour usually situated about the middle of the tongue towards the tip, or by the ragged ill-conditioned sore, covered with fungus, and bleeding upon the slightest irritation; both of which are characterized by deep-seated lancinating pain, extending to the throat and base of the skull, and terminate eventually, if not interrupted in their progress, by total destruction of the organ. Children are occasionally subject to this disease, but it occurs most frequently in persons beyond the middle age.

TREATMENT OF CANCER OF THE TONGUE.

There are two operations in use for the removal of the scirrhous or cancerous tongue—*excision* and *ligature*. The former was much employed by the older surgeons, but owing to its frequent failure, and the difficulty of arresting the hemorrhage, is now seldom resorted to. To small tumours, however, the knife is well adapted; for generally the tongue may be pulled out and fixed so securely as to enable the surgeon to tie any vessels that may spring. The ligature, when applied in the manner first pointed out and performed by Sir Everard Home, is a very effectual remedy, easy of execution, and by no means painful. The surgeon takes a common crooked needle, and having drawn it to the middle of a strong ligature, passes it through the substance of the tongue immediately behind the tumour. The middle of the ligature being cut and the needle removed, there are left hanging two ligatures, one of which is to be drawn forcibly on one side of the tumour, and the other on the opposite side, so as to include a segment of the tongue. A sharp pain follows the tightening of the ligatures, but this soon subsides, and the patient afterwards feels little inconvenience except from salivation, which usually ensues in a few hours after the operation. In four or five days the tumour sloughs away and leaves an extensive granulating surface, which fills up with great rapidity. *Arsenic* has been extolled by Lane and others for the removal of cancer of the tongue, but I have never employed it.

For *prolapsus* of the tongue, or extraordinary enlargement, excision can never, I conceive, become necessary. On the contrary, the simple but efficient plan originally suggested and practised by Lassus, and recently, with so much advantage, resorted

to by the distinguished Crosse of Norwich—gradual restoration by leeches, bandages, pressure, &c., of the tongue to its natural situation—should invariably be tried before severer methods are thought of.

See Home on Cancer, p. 111 and 207; C. Bell's *Operative Surgery*, vol. ii. p. 29; Lane's Case of Ill-conditioned Ulcer of the Tongue successfully treated by Arsenic, in *Medico-Chirurgical Transactions*, vol. viii. p. 201; Louis, *Sur les Maladies de la Langue*, in *Mémoires de l'Académie de Chirurgie*, octavo edit. tom. 14, p. 364; Lassus, *Pathologie Chirurgicale*, tom. ii. p. 160; Dupuytren, *Clinique Chirurg.* tom. iii.; Liston's *Practical Surgery*, p. 243, 3d ed. 1840.

SECTION VI.

CANCER OF THE BREAST.

THE female mamma is oftener the seat of carcinomatous disease than any other part of the body; though the male breast is rarely affected. Women who have suckled a great many children, and unmarried females, when they arrive at that period of life when the catamenia cease, are in a peculiar manner liable to suffer. In a few instances I have met with tumours, having all the marks of genuine scirrhus, in girls under the age of sixteen.

Generally a small tumour is first perceived in the substance of the breast, not far from the nipple, so loosely connected with the surrounding parts as to move freely under the finger, and devoid of pain unless rudely handled, or stretched by the pectoral muscle during the movements of the arm. For many years the tumour may remain stationary, but in other instances it grows rapidly and sometimes acquires great bulk. In the worst cases, however, the lump, after having attained a moderate size, becomes shrivelled or contracted, the nipple curls inward, and is soon buried below the surface, the skin assumes a leaden colour, and adheres to the tumour so closely as not to be lifted from it; the whole breast is altered in shape, is irregular and knotted on the surface, and of a stony hardness, attended with deep

stinging or lancinating pain, extending to the arm-pit or into the chest. The lymphatic glands now suffer, and the whole chain along the arm-pit, under the clavicle, and up the neck, is successively enlarged and indurated. Sometimes the glands of the axilla are not affected, while those near the sternum or in the intercostal spaces are thoroughly contaminated. When the disease has advanced thus far, the skin usually gives way, and is followed by the discharge of a thin, sanious matter. Soon afterwards a fungus shoots forth and occupies the ulceration, while the edges appear irregular and distorted. Oftentimes, however, the patient is destroyed before the ulcerative stage is established—the disease having extended to the lungs and produced dyspnoea, cough, hectic fever, emaciation and death.

In some instances, on the other hand, I have known the patient to live ten or fifteen years, after extensive ulceration and contamination of the lymphatic glands had been established. Many cases, indeed, have been reported where the bony system has degenerated and crumbled away under the influence of constitutional disturbance, and yet the patient has survived, though bed-ridden and helpless for a long time.

TREATMENT OF CANCER OF THE BREAST.

In the early stages of scirrhus breast, or when the tumour is solitary, free from pain, not attached by adhesion to the surrounding parts, and the axillary glands uncontaminated, there is every prospect of success from an operation skilfully performed. The entire removal of the breast, however, in such a case will seldom be necessary, though the remark of Mr. Hunter should never for a moment be forgotten—that the disease often extends much further than the eye can discover. In dissecting out, therefore, an apparently insulated lump from the breast, the surgeon should make it a rule to go beyond the immediate limits of the tumour into the sound parts, taking care at the same time to injure them as little as possible by his fingers, knives, or hooks. In most cases a single incision through the skin two or three inches in length, will afford ample space for the removal of the diseased parts.

When the disease has advanced so far as to involve the whole breast and adjacent lymphatic glands, a very different kind of operation will be required. The patient should be laid on a

strong *narrow* table, previously covered by blankets, and her head, shoulders and back raised and well supported by pillows. The arm of the affected side should be carried off at a right angle from the body to put the pectoral muscle on the stretch, and kept by an assistant in that position until the operation is finished. The surgeon should stand on the opposite side, and commencing his incision in the arm-pit, below the edge of the pectoral muscle, extend it along on the lower or outer side of the nipple, two inches beyond the base of the breast. A second incision should be commenced at the spot from which the first started, and carried downwards, between the nipple and sternum, until the two meet below the breast. An oval space is thus formed, between two curvilinear cuts, which includes the nipple, areola, and perhaps two or three inches of skin in breadth. The integuments are next elevated from the outer edges of the breast, until the greater part of it be fairly exposed; then the breast must be separated from the pectoral muscle beneath, by a regular but careful dissection from below upwards, as far as the axilla. Should the lymphatic glands be found free from disease, the breast may be removed at once; if, however, the glands are enlarged, or otherwise so contaminated as to require extirpation, then the breast serves as a handle, and by its weight drags them down, and the whole diseased mass is removed in a string. During the progress of the dissection the arteries should be taken up the moment they are cut, otherwise they speedily retract among the cellular membrane, and do not afterwards bleed, until the dressings are applied and the patient put to bed. Owing to negligence in this respect, secondary hemorrhage is more frequent after amputation of the breast than any other operation in surgery. Before the edges of the wound are brought together, the whole surface, from which the tumour has been taken, should be accurately examined, and any diseased portions that may have been left, carefully removed by the knife or scissors. When the two curvilinear incisions are made in the manner directed, there is no redundant skin, and the edges meet with the utmost nicety; the surgeon has only, therefore, to retain them in contact by a few adhesive straps, supported by lint and a common roller. In several instances in which I have performed the operation, the wound has healed nearly by the first intention.

Under favourable circumstances the operation very frequently succeeds perfectly, and the patient never has the slightest return of the complaint; it must not be concealed, however, that it often

recurs very unexpectedly, and advances with wonderful rapidity, and in a way plainly to show—that the knife has not only not eradicated the disease, but hastened its progress. A surgeon, therefore, who values his reputation and the good of his patient, will be very careful not to promise too much, and never to operate unless there is some prospect of success—leaving the hopeless cases to be palliated by diet and medicines, and the unfortunate patients to live as long as their inveterate malady will permit. I say nothing of the use of the actual and potential cauteries, of *artificial* gangrene, as proposed by Rigal, Garneri, and other French surgeons, of *pressure*, as recommended by Young, because I believe them all to be worse than useless, or only beneficial under circumstances in which the knife will prove less painful and more expeditious.

Perhaps, also, it may be stated, with certainty, that wherever the lymphatic glands are much enlarged and of stony hardness, the operation never succeeds. Such was the opinion of the late Dr. Physick; and my own experience confirms it. That excision of the mamma, however, is never successful, under any circumstances, as some modern surgeons contend, I am far from being prepared to believe; for I have one patient still living in Maryland, upon whom I operated thirty years ago, and several others, where ten, fifteen, and twenty years have elapsed without a return of the disease.

In conclusion, I may state, that there are many indurated lumps of the breast, proceeding from derangement of the digestive functions, from irregularities of the catamenial discharge, and from accumulated milk—easily removed by internal medicines, appropriate diet and local applications. Of these I shall treat in another place.

See Home on Cancer; Adams on Cancerous Breasts; Abernethy's Surgical Works, vol. ii. p. 68, 1819; Johnson on Cancer, p. 25, and 116; C. Bell's Surgical Observations, vol. ii. p. 1; Allen's Surgery, p. 235, and 313; C. Bell's Operative Surgery, vol. i. p. 177; C. Bell on the Varieties of Diseases comprehended under the name of Carcinoma Mammæ, in Medico-Chirurgical Transactions, vol. xii.; Illustrations of Diseases of the Breast, by Sir Astley Cooper, 4to. London, 1829; Cumin, in Edin. Med. and Surg. Journal, vol. xvii.; Liston's Practical Surgery, 3d edit., London, 1840, p. 334; Traité des Maladies du Sein., par M. Velpeau, Paris, 1838, 8vo. Boylston Prize Dissertations, by Usher Parsons, M. D., article Cancer of the Breast, p. 149—Boston, 1839.

SECTION VII.

CANCER OF THE UTERUS.

PROLAPSUS and polypus of the uterus, and venereal ulcerations of that organ, often bear so striking a resemblance to cancer, as hardly to be distinguished from it. A minute inquiry, however, into the history of the disease and careful manual examination, will enable the surgeon in most instances to decide correctly.

The usual symptoms of cancer of the womb are, pain in coitu, a discharge of acrimonious, offensive, sanious matter, shooting pains at the lower part of the abdomen and throughout the pelvis; but as these are equivocal and common to other uterine and vaginal complaints, other diagnostics must be sought for. When in a scirrhus state the neck of the uterus will be found enlarged, unusually heavy, indurated in some parts, softened in others, and placed lower in the vagina than natural. Its orifice also is enlarged and irregular. After ulceration has taken place, the patient complains when the part is touched, the finger is soiled with blood and matter, and the whole diseased surface feels rough and unequal. The vagina, too, is more or less affected, loses its natural rugose structure, becomes so contracted or filled up by indurated folds that the finger cannot be introduced without great pain, and finally takes on ulceration, which extends to the external parts of generation, and in some instances even to the thighs and abdomen.

When the disease begins within the cavity of the uterus, its progress is somewhat different. The neck for a long time remains unaltered, while the body of the womb enlarges in every direction, and soon attains a considerable magnitude. From its cavity is copiously distilled a very fetid, acrid matter, mixed with lumps of putrid sloughs, and quantities of blood. In this wretched condition a few patients have been known to exist upwards of ten or twelve years; but generally the strongest constitutions sink, under the repeated hemorrhages and suffering, within a much shorter period.

Cancer of the uterus is seldom met with in patients under forty or fifty years of age—though it has been seen by Cruveilhier and others, at twenty and thirty—and next to cancer of the breast occurs oftener perhaps than any other similar affection. Indeed,

the two diseases not unfrequently exist in the same individual simultaneously.

When examined by dissection, the neck and body of the uterus are found, generally, soft and spongy, or full of cavities from which worm-like portions of matter may be squeezed. The lymphatic glands of the pelvis, as well as the lumbar glands, are also more or less diseased—the former, however, oftener than the latter. The same may be said of the inguinal glands in advanced stages of the disease. From pressure on the ureters and kidneys by the enlarged uterus or diseased glandular masses, the functions of these organs may be so interfered with as to cause death sooner than it might otherwise take place. For these pathological remarks we are indebted, chiefly to Cruveilhier, who also has stated that *gangrene* of the morbid mass and adjoining parts is not an unfrequent termination of uterine carcinoma.

TREATMENT OF CANCER OF THE UTERUS.

Unfortunately the remedies for this disease, when it affects the whole body of the uterus, are palliative only—such as low diet, frequent purging, opium, rest in a horizontal position, astringent injections, repeated and accurate ablution. But that scirrhus, when confined to the neck of the uterus, may be successfully removed, is proved beyond all doubt—by the result of numerous interesting cases, in which the operation of excision has been performed. Professor Osiander, of Gottingen, was the first to execute so bold a project; though the operation was suggested, it is said, in 1780, by Lauvariot, and recommended by Troisberg, in 1787. The first operation of the kind was performed by Osiander, in 1801, on a widow, whose vagina was filled by a very vascular, fetid fungus from the orifice of the womb, as large as a child's head. By means of Smellie's forceps the fungus was brought down low in the vagina, but being accidentally broken off, a tremendous hemorrhage ensued; undismayed, however, by this event, the operator determined to proceed, and immediately pushed a number of crooked needles armed with strong ligatures through the bottom of the vagina and body of the uterus until they emerged at the inner orifice. These ligatures served to draw down the uterus and retain it in the

vagina near the external orifice. The surgeon then introduced a strong bistoury above the scirrhus portion, and divided the womb completely in a horizontal direction. The hemorrhage for an instant was violent, but speedily suppressed by a sponge saturated with styptics, and the patient recovered in three or four weeks. Osiander afterwards performed eight similar operations upon different patients, all of whom recovered without the slightest difficulty. Dupuytren also has performed the operation eight times; but instead of employing the ligatures and bistoury recommended by Osiander, he drew down the uterus with forceps, and divided it above the scirrhus part by curved knives and scissors. One of the patients upon whom Dupuytren operated had a return of the disease, and submitted to a second operation with no better success, until Recamier, a surgeon of the Hotel Dieu, contrived a speculum through which caustic was repeatedly introduced, and by it a complete cure was at last effected.

Within the last few years this operation for the removal of the *neck* of the uterus has been frequently practised, sometimes successfully, at other times with an unfavourable result.* There is much reason to believe, however, that many of these operations were not actually required, that in other instances, both in Europe and in this country, the cures reported did not take place, *eventually*, or that the diseases were not of the carcinomatous kind. This should induce the surgeon to discriminate, carefully, and not undertake what can never, without considerable risk, be accomplished, inasmuch as we cannot extend our incisions more than six or eight lines along the neck of the uterus, without opening the peritoneum.

A still bolder project, however, has been carried into effect by Professor Langenbeck of Gottingen—the extirpation of the

* “It is only at the Hospital of La Pitie that opportunities have as yet been afforded of witnessing the excision of the neck of the uterus. In 1828 M. Lisfranc stated to the Royal Academy of Medicine, that he had performed this operation on thirty-six individuals for cancer uteri. Of that number thirty were then well, three dead and three in progress of recovery. One female operated on some years before had since become pregnant, and recently given birth to twins. Lately at the Hotel Dieu, the entire uterus has been removed by M. Recamier; and in September last this formidable operation was performed at La Charité by Roux. The patient died in twenty-four hours after the operation.” See Practical Formulary of the Parisian Hospital by F. S. Ratier, M. D. p. 17.

whole uterus, by an operation somewhat resembling the Cæsa-rean section. This operation was performed on a woman thirty-nine years of age, of delicate constitution, and the mother of ten children.* “The rectum having been previously evacuated by an injection, the patient was placed with the pelvis raised higher than the rest of the body; a catheter was introduced into the bladder, and a sort of speculum into the rectum, both of which were held by an assistant. The operator standing on the left side of the pelvis, made an incision through the linea alba from the symphysis pubis to within two inches of the umbilicus, and finally, into the cavity of the belly, cutting through the peritoneum. An assistant then introduced his left hand, and pressed the bowels out of the way, while with his right, he endeavoured to hold the bladder against the symphysis pubis. The operator took hold of the uterus with his left hand, while with the right he introduced a long pair of forceps made for the occasion, and having taken hold with this instrument, he began at the right ovarium, and thence dissected out the *whole uterus together with the scirrhusities of the vagina*, completing the operation in seven minutes. No blood flowed from the vagina, nor was there any prolapsus of the intestine, although the finger could be passed from the cavity of the belly through the vagina. At the suggestion of Professor Mende, the wound was brought together by very long straps of adhesive plaster; a sponge was left in the vagina, a bandage applied to the abdomen, and the patient put to bed. The uterus, especially its right side, was found to be greatly eroded by the cancer; the os uteri destroyed by deep and foul ulcers, and the portion of the vagina removed with the uterus was in like manner diseased. The patient *sunk rapidly* after the operation; the face became more and more collapsed, and the pulse throughout the whole day was very quick and small. She drank chamomile tea to allay her thirst. In the evening, cold sweating of the head and chest, and at nine, P. M., she took Dover’s powders, but obtained no sleep. The sweating and the excruciating pain continued; no urine had then been discharged after the operation. Next morning the patient took two grains of musk, but immediately rejected it, and the vomiting continued more or less during the day, and could in no way be allayed. The pulse could scarcely be counted. The use of

* Philadelphia Journal of the Medical and Physical Sciences, No. 10, New Series, p. 349.

the catheter brought away but a small quantity of urine. Finally, the patient *died* at five P. M. Upon *dissection* the peritoneum was found covered with coagulable lymph, which even united the intestines with each other, and could be drawn out into long threads; the bowels were red, inflamed, and inflated, especially the smaller portions. In the cavity of the pelvis *a great quantity of coagulum* was found, especially on the right side. The urinary bladder was *gangrenous* and easily torn, especially at the fundus; but all the scirrhus parts were cut out. No marks of disease were found in other organs.”*

See Observations on the Cure of Cancer of the Womb by Excision, by F. B. Oslander, in Edinburgh Medical and Surgical Journal, vol. xii. p. 286; Dictionnaire des Sciences Medicales, tom. iii. p. 588, and 600; also, tom. xxiii. Article Hysterotomie, p. 293; also tom. xxxi. p. 240; Chelius, Traité de Chirurgie, Paris, 1835; Malgaigne, Man. de Med. Operat. Paris, 1837; Blundel, in Lond. Med. Gazette, 1828; Brown, in Dublin Journal of Medical Sciences, vol. vi.; Edinburgh Med. and Surg. Journ. 1830; Velpeau, Nouv. Elem. de Med. Oper. 1839.

SECTION VIII.

CANCER OF THE RECTUM.

THIS, like most other cancerous affections, seldom occurs except in persons advanced in life, and is more common among women than men. It commences in the mucous membrane of the gut, which is thickened and indurated, and its surface sometimes covered with rounded or irregular tubercles. The peritoneal and muscular coats are also enlarged and their interstices filled by numerous membranous partitions. At last all traces of the natural structure are lost, and the different coats are converted into a homogeneous substance resembling gristle,

* The above account has been transferred to these pages, not for the purpose of commending the operation, which in our opinion would hardly be deemed justifiable in any case, but as a matter of historical record, and as a beacon to the young surgeon, warning him not to pass the boundaries of *good* surgery. under the fallacious hope of rising in his profession by *desperate* means.

which occupies so large a portion of the cavity of the rectum as almost to obliterate the passage. Thus situated, the patient makes violent and often ineffectual efforts to expel the fæces, which when they are discharged, are squeezed into a very narrow compass, and resemble worms in form. These efforts give rise to pain and inflammation about the rectum and neck of the bladder, and frequently produce suppression of urine and other distressing symptoms. Moreover, the incessant irritation kept up within the cavity of the gut hastens the ulcerative process; large quantities of ropy mucus are then discharged, mixed with ichorous, offensive matter, a fungus sprouts from the ulcerated surface and frequently covers the whole verge of the anus. The disease having reached this height must necessarily soon terminate in death, which takes place either from over-distention of the bowels above the strictured part, or from general irritation and debility.

When examined by dissection, all the parts adjoining the rectum are found more or less diseased, and the bladder, gut, and vagina often communicating freely with each other by ulcerated openings. There are strictures and other diseases of the rectum bearing some similitude to cancer, that will be noticed under a different head.

TREATMENT OF CANCER OF THE RECTUM.

To prevent an entire closure of the rectum and to render the patient's situation as comfortable as possible, is as much as we can accomplish; for, whatever, may be said to the contrary, genuine scirrhus or cancer of the rectum is absolutely incurable.

The following case, reported in the North American Medical and Surgical Journal, No. V., p. 201, may seem to militate against the position just laid down—that cancer of the rectum should be looked upon as incurable. But we must still reserve the privilege of adhering to our position, until further evidence to the contrary be adduced. In the mean time the reader is furnished with the statement alluded to, from which he may draw his own inference. “The operation of *excision of the rectum* was performed on the 15th of February, 1826, at the Hospital La Pitié, by Lisfranc. The patient, named Poulain, aged forty-five years, was of good constitution, and in good health, but had suffered from hemorrhoids, for fifteen years; for some months previous, severe lancinating and intermittent pains were experienced, espe-

cially at stool. M. Lisfranc, on examination, discovered that a portion of the rectum, occupying about an inch and a half of the mucous membrane in height and in circumference, was in a scirrhous state, and the part which was inverted by straining presented eminences resembling the tumours at the verge of the anus. As this induration was attended with lancinating pain, Lisfranc assured the man that an operation was essential. After some ineffectual attempts to invert the diseased surface of the rectum, M. Lisfranc partly succeeded, by inserting into the rectum the index finger of the left hand in a semiflexed position, and by thus drawing down the part while the patient threw the abdominal muscles into action. He now seized with a pair of strong curved scissors, and towards the verge of the rectum, a part of the tumour, which was incised as deeply as possible, without completely detaching this portion. This could now be more easily seized with the fingers, and by its means the whole of the diseased part was withdrawn externally. The operation was continued by incisions in a circular direction, so as to remove at once, (*en masse*,) the affected tissues. On examination, about half of the sphincter ani was found removed. The hemorrhage was abundant, but was arrested by filling the rectum with lint, and making pressure with a T bandage. In a few hours the dressings were forced out by severe bearing down efforts, with a return of the hemorrhage. The tampon was again employed—some fever supervened—and another effort at stool during the night, forced out the lint with coagula of blood. No return of the bleeding, and of course no renewal of the tampon; no bad symptoms supervened; on the third day, a rectum bougie, of large size, was directed to prevent the contraction of the rectum; and on the 12th of April the patient left the hospital perfectly cured."

This operation appears not to have originated with Lisfranc; for Morgagni speaks of its having been attempted in his time; and Faget, in 1739, performed it, successfully—it is said. Since Lisfranc's operation, however, in 1826, he has performed it eight times upon patients of both sexes; has cured five and lost four—according to his own account. Some other European surgeons have followed his example and have reported both favourable and unfavourable results. Sir Benjamin Brodie, and most other surgeons of sound views and experience, still object to the proceeding, not on account of its difficulty, but the certainty, almost, of return of the disease; which has taken place in several instances, notwithstanding the lower portion of the gut

has been removed to the extent of three inches. By Malgaigne and others, different operations of the kind have been minutely described.

By common wax bougies, or by pieces of sponge cut into a proper shape, dipped in melted wax and afterwards rolled with a spatula and polished, oiled, and introduced into the rectum beyond the contracted portion, and suffered to remain for two or three hours at a time, or longer if they do not excite too much irritation, and worn for several weeks or months, the passage may be so much enlarged as to permit a free discharge of fæces, and thereby relieve the patient from the unpleasant necessity of perpetual straining to procure a stool. The size of the dilating instrument should be gradually increased in proportion as the passage widens. Conjoined with this local treatment, moderate diet and occasional purgatives will be found extremely serviceable in keeping the bowels regular, and in obviating inflammation. After ulceration is established, the bougies or tents must be discontinued, as they will only serve to aggravate all the symptoms. To relieve the patient from pain and procure sleep, an opium pill softened and deposited in the rectum by the end of a bougie will be found the most effectual remedy. Sir Benjamin Brodie recommends alkalies and balsam copaiba internally, and injections of opium, and of lime-water and linseed oil—as palliatives, merely. Care should be taken, however, not to derange the functions of the liver and bowels by too free use of opium. Copeland recommends in obstinate cases that have long resisted the bougie, a division of the indurated contraction by the bistoury.

See Desault's Works, by Smith, vol. i. p. 366; Home on Cancer, p. 139; Monro's Morbid Anatomy of the Human Gullet, Stomach, and Intestines, p. 347; Baillie's Morbid Anatomy, p. 173; Copeland's Observations on the Principal Diseases of the Rectum; Sherwin on the Scirrhus-contracted Rectum, in Memoirs of the London Medical Society, vol. ii.; White on the Contracted Intestinum Rectum; Howship on the Rectum; Mayo on Diseases of the Rectum, Lond. 1833; Colles, in Dublin Hospital Reports, vol. v.; Sir Benjamin Brodie, in Lond. Med. Gazette, vol. ix. and xvi.; Cruveilhier, Anat. Patholog. tom. ii. Paris, 1836; Malgaigne, Man. de Med. Oper. 1837; Velpeau, Nouv. Elém. de Méd. Oper., Paris, 1839; Houston, in Dub. Hosp. Rep. vol. v.

SECTION IX.

CANCER OF THE PENIS.

BOTH the prepuce and the glans penis are liable to cancer; fortunately, however, the disease is not very common. Persons troubled with natural phimosis are most subject to it—owing, perhaps, to a morbid sensibility of the glans, produced by its confined situation. A tubercle or wart first appears among the glands of the prepuce or on the glans penis itself. Its base is broad and deeply seated, and seems to be a continuation of the substance of the part upon which it is situated, rather than a diseased superstructure. This will distinguish it from the venereal wart, with which it has sometimes been confounded—the latter having a narrow neck or pedicle while the top is expanded. Whether it occupy the prepuce or glans, the cancerous tumour slowly advances, and at last ulcerates and throws out a cauliflower-like fungus. Then there is a plentiful discharge of fetid matter, mixed with blood, and severe pains are felt darting along the penis into the abdomen. In time, the spongy and cavernous bodies of the penis are contaminated, the inguinal glands swell, as well as those about the rectum, and the patient's constitution is completely ruined. The disease, in some instances, however, runs its course without affecting the inguinal glands. Sometimes the penis sloughs off as high as the pubes; at other times it is gradually destroyed by ulceration. Cancer of the penis is commonly met with amongst old and dissolute subjects who have frequently suffered from venereal attacks; but it may also occur in healthy persons from contusion and other external injury, as proved by Sir Everard Home, in his interesting account of the case of J. Wallace.

TREATMENT OF CANCER OF THE PENIS.

When the tumour is small, not of long standing, and confined to the prepuce or common skin of the penis, it may sometimes be dissected out with success. In most instances, however, amputation of the penis is the only resource, and even this does not always answer; in general it may be stated, that an operation

is fruitless after contamination of the glands about the groin and root of the penis. Before amputation is decided upon, the surgeon must be well assured of its necessity; for it has happened that the glans penis has been found after its removal perfectly free from disease, or only covered by venereal warts. In doubtful cases the prepuce should be slit up previous to amputation.

There are two or three modes of amputating the penis—each very simple. It may be done by a single stroke of the knife; or by two separate cuts, the first through the skin, which is drawn towards the pubes, the second through the body of the penis. The object of this particular mode is to save the skin, as in common amputation of the limbs, to cover the stump; but experience proves that there is always enough, and frequently too much skin, which by interfering with the stream of urine, or forming a pocket for the lodgement of matter, is attended with serious inconvenience. Both these operations are objectionable upon another ground—the difficulty and sometimes impossibility of arresting the hemorrhage, especially when amputation is performed near the pubes, from the shrinking of the corpora cavernosa into the perineum; an accident from which several patients have lost their lives. On this account I prefer the operation proposed by Schreger, which is done in the following manner.

The surgeon takes hold of the penis, and drawing the integuments as much forward as possible, secures them by a tape. An incision is then made through that part of the skin which immediately covers the *dorsal arteries*. These are cut and tied. The next incisions penetrate the corpora cavernosa until the two *arteriæ profundæ* are opened. These being secured in like manner, it only remains to divide the corpus spongiosum urethræ. This must be done gradually, or in such a manner as to divide and tie the two *arteriæ cavernosæ* before the penis is entirely separated. The advantages gained by this mode of operating must be very apparent, since the surgeon by preventing the retraction of the penis until the six principal arteries are secured, has the hemorrhage completely under his control.

The sides of the urethra, in some instances, unite permanently after amputation of the penis. Cases of the kind are recorded by Le Dran, Hey, Desault, and Brandi. To prevent such an accident, which would necessarily produce retention of urine and other ill effects, many writers recommend the introduction of a metallic cannula or gum elastic catheter. There is reason

to believe, however, that the occasional use of a probe or small bougie would answer every purpose, without subjecting the patient to the pain and inconvenience of wearing an instrument constantly.

The surgeon should make it a rule in amputating the penis, never to remove more than is absolutely necessary to destroy the disease; for it is now well ascertained, that the glans penis may be lost without annihilation of the procreative powers. The operation should never be performed after contamination of the inguinal glands.

See Hey's Practical Observations in Surgery, p. 461, 3d edit.; S. Cooper's First Lines of the Practice of Surgery, vol. ii. p. 204, 4th edit.; C. Bell's Operative Surgery, vol. i. p. 130; Home on Cancer, p. 1; Pearson on Cancerous Complaints; Roux's Narrative of a Journey to London in 1814, p. 261; Wadd's Cases of Diseases of the Prepuce and Scrotum, p. 17, plate 7; Velpeau, Nouv. Elém. de Méd. Opér., Paris, 1830; Travers, in Med. Chir. Trans. vol. xvii.; Malgaigne, Man. de Méd. Op.

SECTION X.

CANCER OF THE TESTICLE.

UNDER the name of *sarcocoele*, several diseases of the testicle have been comprehended, very different in their nature. These will be considered at a future period under separate heads. The present remarks will apply exclusively to that condition of the testicle which bears a striking similitude to the scirrhus and cancerous structure met with in other parts of the body.

The external characters are a stony hardness of the body of the testicle and epididymis, accompanied by enlargement, great inequality, and uncommon weight—the tumour feeling, when handled, like a lump of lead. In the progress of the disease, the cord and inguinal glands become contaminated and enlarged, and if the patient survives sufficiently long, the scrotum sometimes inflames and ulcerates, and throws out the bleeding fun-

gus peculiar to cancer. The symptoms are deep-seated, lancinating, and incessant pain, extending up the cord, along the loins, and down the thighs. The true malignant scirrhus of the testicle seldom attains a very large size. I have met with two or three instances, however, where the tumour became as large as a cocoa-nut, and was surrounded by water—constituting the disease usually called hydro-sarcocele. From forty to sixty years of age is the period at which the scirrhus testicle generally occurs. When advanced, the patient's health always declines,—as shown by sallow complexion and emaciation. When dissected, the morbid structure is found to correspond exactly with that of the cancerous breast.

The *cancer scroti*, chimney-sweeper's cancer or sootwart, a disease endemial in England, and in its advanced stage resembling in many respects common cancer of the testicle, has never been seen, that I know of, in America. This may perhaps be owing to the general use of wood instead of bituminous coal, or to the circumstance of negroes alone being employed in the sweeping of chimneys.

TREATMENT OF CANCER OF THE TESTICLE.

Although the scirrhus or cancerous testicle may remain for a long time dormant, in the end it is sure to display its true character, and to prove fatal unless arrested by an operation. Before the surgeon ventures, however, to decide upon so important a measure, he must be well assured not only of its necessity, but of its probable success. There are two points then deserving attention—not to confound the scirrhus testicle with other tumours bearing a resemblance to it, such as fungus hæmatodes, venereal sarcocele, scrofulous enlargement of the testicle; and again—never to operate after the cord has become extensively diseased and the glands of the groin, or those within the abdomen, contaminated.

The extirpation of the testicle is one of the most simple but severe operations in surgery. It is performed in the following manner. The patient is placed on the edge of a table and the thighs kept asunder, while the surgeon seated before him, grasps the testicle in one hand, and with the other makes an incision through the skin, commencing above the abdominal ring and ex-

tending to the base of the scrotum. Some of the branches of the external pudic now spring, and must be secured by ligature. A second incision lays bare the cord, and freely exposes the tunica vaginalis. With the handle of the knife, and by slight dissection, the cord is gently separated from the loose cellular membrane around, to an extent sufficient to admit the finger beneath it, and carefully examined, lest a small hernia or piece of omentum should be concealed within the condensed cellular membrane attached to its sheath. The next step is to divide the cord, not by a single stroke, but by successive touches of the knife, picking out the arteries, as they spring, with the point of the tenaculum or forceps, and tying each separately with a very fine ligature. The whole being secured, and all danger of hemorrhage at an end, the cord is cut across, and is immediately drawn up to the ring by the action of the cremaster muscle. It only remains to detach the testicle from the scrotum and loose cellular membrane which surrounds it. This is easily accomplished, and without much pain, as the sensibility of the testicle is very much blunted after the separation of the cord. In general, it is best to take away the tunica vaginalis with the testicle. The operation is finished by drawing together the edges of the scrotum with three or four stitches, covering the part with lint and supporting the whole by a bag truss or handkerchief.

The arteries of the cord are sometimes so much enlarged as to bleed profusely, if not well secured, and several patients have lost their lives either from negligence of the surgeon, or from the cord slipping within the ring before the vessels were tied. On this account, a general practice formerly prevailed of including the whole cord in a single ligature. But the great pain and violent symptoms, arising from compression of the vas deferens and numerous nerves of the cord, which sometimes followed, rendered the operation extremely objectionable, and induced Sir Everard Home to attempt an improvement on it, by excluding the vas deferens and encircling the remainder of the cord by passing a needle, armed with two ligatures, through its centre, and tying one on each side of it—thereby making the compression more effectual, and obviating all risk of the ligatures slipping. Even with this modification, however, the plan is still reprehensible, since it exposes the patient to unnecessary suffering without adequate advantage; for it is now acknowledged, that it is seldom necessary to secure more than two ar-

teries—the spermatic and that of the vas deferens. These, it is true, are sometimes greatly enlarged, but, nevertheless, perfectly under command of the surgeon, when he follows the course I have pointed out. At any rate, it is very easy to include the whole cord in a ligature, after having failed to secure the individual vessels. The arteries of the scrotum are often of large size, and, when cut, shrink among the cellular membrane, and do not bleed until the dressings are applied and the general circulation is completely restored. The surgeon should be aware of this, and endeavour to tie them before the operation is finished. When the scirrhus testicle attains an unusual magnitude there will be a redundancy of skin, unless two curvilinear incisions are made—instead of a single cut—in the manner formerly directed for cancerous breast.

Weinhold has proposed, in cases of diseased testis, to cut across the cord merely, and leave the tumour in the scrotum to be diminished or removed by absorption; and the practice has received the sanction of Maunoir of Geneva. The idea is extremely ingenious, and the practice might answer, possibly, for tumours of non-malignant character; but is not likely to succeed in cancer of the testicle.

Consult Home on Cancer, p. 116 and 231; C. Bell's Operative Surgery, vol. i. p. 222; Cooper's First Lines, vol. ii. p. 129 and 135; Desault's Works, vol. i. p. 390; Ramsden's Practical Observations on Sclerocele; *Nouvelle Méthode de traiter le Sarcocèle, sans avoir recours à l'Extirpation du Testicule*, par C. Th. Maunoir, 8vo. 1820; *Chirurgical Lectures on Surgery*, delivered at Hotel Dieu, in 1832, by Baron Dupuytren, published by an Association of Physicians; translated from the French by A. Sidney Doane, A. M., M. D., article Engorgement of the Testicles, p. 64; The Lectures of Sir Astley Cooper, Bart., F. R. S., Surgeon to the King, &c., &c., on the Principles and Practice of Surgery, with additional Notes and Cases, by Frederick Tyrrel, Esq., &c., vol. ii. p. 119; *Observations on the Structure and Diseases of the Testis*, by Sir Astley Cooper, Bart., F. R. S. 4to. London, 1830; Velpeau, *Nouv. Elém. de Méd. Operat.*, Paris, 1839; L. F. Malgaigne, *Mem. de Méd. Operat.*, Paris, 1832; *Sketches of Med. Schools of Paris*, by J. Greene Crosse; Liston's Practical Surgery, London, 1840, p. 449.

SECTION XI.

FUNGUS HÆMATODES.

MR. JOHN BURNS, of Glasgow, was the first to give any regular account of this very formidable and destructive disease. His observations were soon followed by those of Hey and Abernethy, both of whom described the affection under a different appellation. The term fungus hæmatodes, invented by Hey, has been considered less objectionable than any other, and therefore retained by most writers.

This disease may occur in almost any part of the body, but the extremities are particularly liable to it. Though not very common in America, it occurs often enough to deserve the attention of the surgeon. When it occupies any of the external parts it is characterized by the following appearances. In the incipient stage a small tumour is perceived, almost devoid of sensation, smooth on the surface, moveable under the integuments, and elastic to the touch. This may remain stationary for years, without giving the patient the slightest uneasiness, until a blow or strain or some accidental injury causes it to inflame, and then it increases with wonderful rapidity, while the skin loses its natural colour, and becomes mottled or red in some parts and purple in others. In a few weeks the tumour attains a considerable bulk, and in proportion to its growth is rendered protuberant or lobulated; at the same time the veins on its surface are greatly enlarged and very conspicuous, and at no very distant period ulceration takes place in one or more spots, from which a fungus sprouts with the utmost luxuriance. This fungus is of a dark red colour, extremely vascular, and commonly contracted about its neck, while the top is expanded and irregular. The disease having advanced thus far, soon contaminates the contiguous lymphatic glands, which are converted into a substance exactly resembling that of the original tumour. In the mean time, the patient's health gradually declines, the countenance assumes a yellow cadaverous hue, the whole constitution is undermined by hectic, and death speedily follows.

The morbid mass, when examined by *dissection*, exhibits appearances altogether distinct from those met with in any other disease. A very thin and undefined capsule invests the whole

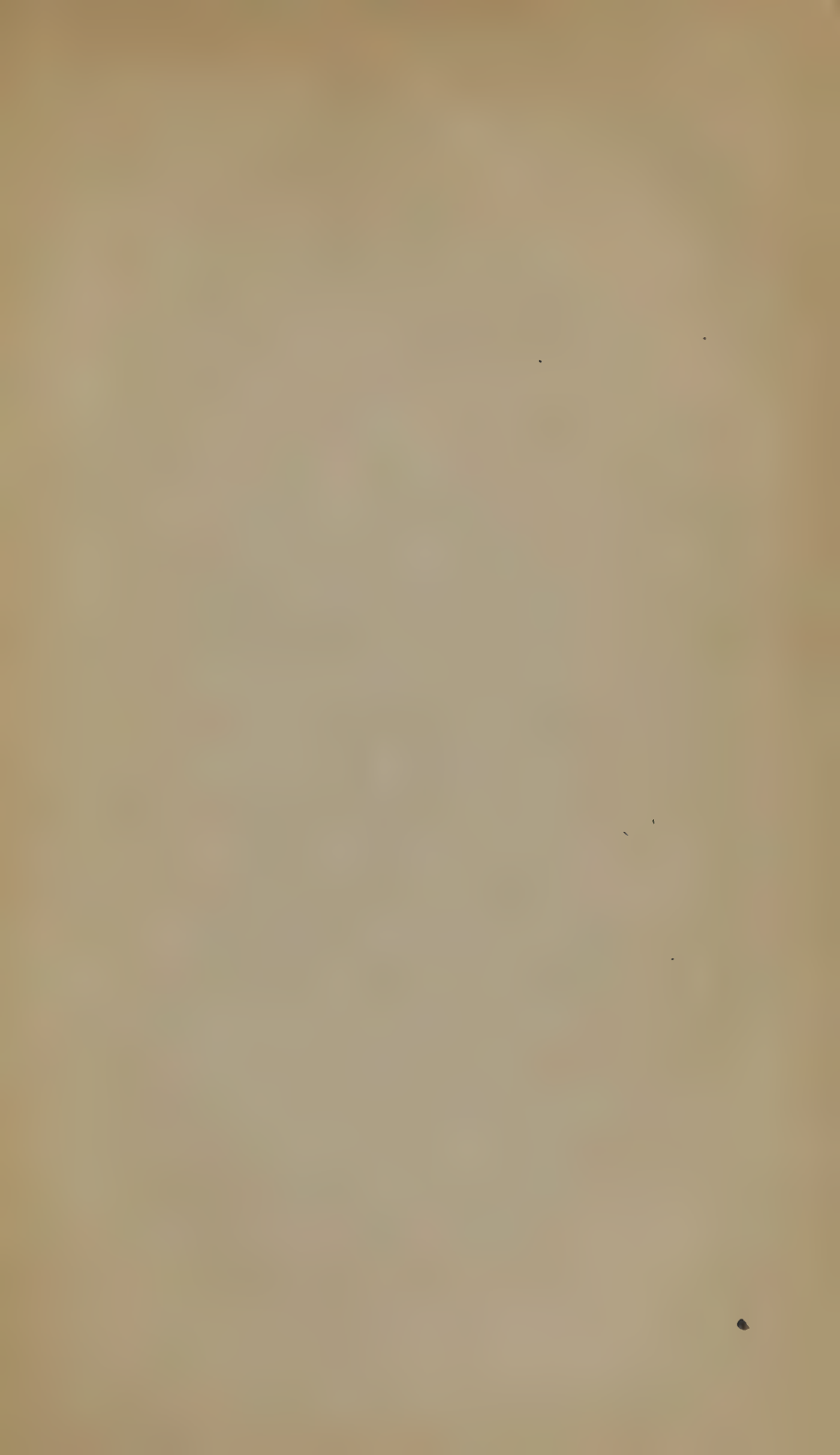
tumour, and, within this, lobes separated from each other by membranous partitions of soft pulpy matter resembling *brain* in consistence and colour, compose the greater portion of the dis-tempered fabric. In the midst of this medullary-like matter are often found cells filled with clotted blood; at other times small cysts are met with containing a thin, sanious, and fetid serum. So extensively involved are all the textures in the neighbourhood of the tumour, that the muscles are often annihilated, or their structure so subverted as scarcely to be recognised, and the arteries, veins, nerves, and cellular membrane all blended together in one confused mass. When the lymphatic glands and those in the course of the circulation are examined, they are found equally diseased, and often throughout the body. The same may frequently be said of the liver, lungs, kidneys, and brain, all which exhibit proofs of universal contamination.

Fungus hæmatodes has been confounded with aneurism, cancerous tumours, and other diseases; and I have known such mistakes attended with very serious consequences. From cancer, to which it bears a greater resemblance than any other affection, it differs in the following respects. The tumour of fungus hæmatodes is large, soft and elastic, and to the touch imparts so deceptive a sensation of fluctuation, that a lancet has often been pushed into it, under an idea that it contained purulent matter. The scirrhus or cancerous tumour, on the contrary, is hard, solid, and incompressible, and in the advanced stages frequently shrivelled or contracted. Fungus hæmatodes, when dissected, is found to consist chiefly of a soft, pulpy, tenacious, medullary-like matter. Cancer, when examined in the same way, exhibits a hard, fibrous substance, resembling cartilage, which occupies the centre of the tumour as a nucleus, and from this centre white narrow bands proceed irregularly towards the circumference. Fungus hæmatodes is almost invariably met with amongst children and young persons—cancer may be said to be almost peculiar to the old. Fungus hæmatodes occurs in organs which cancer never attacks—such as the brain, liver, kidneys, and spleen. Other distinctions might be pointed out, but these are sufficient to designate the complaint. Several attempts have been made of late years, by Andral, Carswell, Copeland, Maunoir, Lobstein, Hodgkin, and others, to enlighten the profession respecting the pathology of fungus hæmatodes; but so far with very little success.

The *eye*, according to late European writers on that organ, is peculiarly subject to fungus hæmatodes. In this country I have never seen more than five or six cases of the disease; these differed materially from cancer of the eye. The retina and optic nerve are the textures in which fungus hæmatodes usually commences, and the first symptom is an obscurity of vision, occasioned by a small shining tumour which occupies the bottom of the posterior chamber, and may be distinctly seen by looking into the pupil. This tumour slowly increases, advances into the vitreous humour, and finally reaches the iris, behind which it appears so much like cataract as to be with difficulty distinguished from that disease. Soon after, the whole eyeball loses its spherical form, becomes irregular or protuberant, the cornea ulcerates, and a large, soft, dark-red, or purple fungus is sent forth. When the diseased mass is removed by an operation and examined, it is found to consist of medullary-like matter throughout, and so exactly resembling in other respects the structure of fungus hæmatodes as to render further description unnecessary. The circumstance of fungus hæmatodes commencing generally at the bottom of the eye, its attacking almost invariably children and young subjects, and the peculiar structure of the morbid mass, are sufficient proofs that the disease is distinct from cancer, which usually occurs in old people, originates in the anterior parts of the eye, and when dissected presents appearances very different from those just pointed out.

The *testicle*, when affected by fungus hæmatodes, sometimes resembles hydrocele so closely, that the most intelligent and experienced surgeon is unable to decide between the two diseases. This deception, however, cannot endure a very long time; for after the fungus hæmatodes tumour attains a moderate bulk, the constitution shows evident marks of contamination, and the lymphatic glands of the thigh and groin are sensibly enlarged. It is hardly possible to confound the scirrhus testicle with fungus hæmatodes of the same organ. The one is very firm in its texture and extremely heavy—the other soft, fluctuating, pulpy, and generally free from pain. When *dissected*, the structure of fungus hæmatodes of the testicle is better marked, perhaps, and affords more striking evidence of the genuine disease than is met with in any other part of the body.

Besides the testicle, fungus hæmatodes occurs primarily in the thyroid gland, lungs, liver, spleen, kidney, female breast, uterus,





Dissection from Nature by W. Wilson

Dissection by J. T. Wood

ovarium, and some other parts, and in almost every instance exhibits characters too distinct and regular to leave any doubt of its being unallied to cancer, or any other affection with which we are acquainted—notwithstanding the assertion of some of the French surgeons to the contrary.

The drawing in Plate VI. is introduced to illustrate the common appearance of fungus hæmatodes when seated on the extremities. The disease occurred in a boy nine years old, commenced about the middle, but finally involved the whole thigh, and in a few months proved fatal.

Plate VII. represents a fungus hæmatodes of enormous dimensions, seated upon the shoulder and arm. The woman was sixteen years old when the tumour was first perceived—about the size of a marble. During four years it gradually increased, and a short time before her death threw out a most prolific fungus, which sloughed away a few hours before the drawing was made, and left the large ulcerated cavity seen on its surface. The tumour remained for many months free from fungus and ulceration, until an opening was made with a lancet by an ignorant empiric who supposed the swelling to be an abscess. Dissection, however, proved it to be fungus hæmatodes, filled with a substance resembling brain, but much finer in texture than usual. The surface of the tumour, as the drawing shows, was uncommonly smooth and free from protuberances, and in this respect differed from the disease usually met with.

TREATMENT OF FUNGUS HÆMATODES.

As regards the treatment of fungus hæmatodes very little satisfaction can be afforded; for in the whole range of surgical disease there is no affection so truly alarming or so intractable in its nature. In vain are internal medicines and local applications prescribed; they do not even palliate the complaint. Even extirpation of the tumour, and that too in its very incipency, answers so little purpose, that there is no case on record where the operation has succeeded. One of the most extraordinary and interesting cases perhaps ever related, in which the fairest trial was given, without effect, to repeated and most extensive operations, is detailed by Mr. Allan.* The patient suffered during

* See Allan's Surgery, vol. i. p. 264.

thirteen years from a very large tumour which occupied the left hip. When it attained the size of a child's head, it was dissected out by Mr. Newbigging, of Edinburgh, apparently with success; for the wound healed and the patient felt perfectly well. At the end of nine months, however, it grew again, and in seventeen months from the first operation, a second was performed by Mr. Russell, upon a tumour as large as the two fists. The wound soon healed, but in nine months following the tumour recurred, and soon equalled in size a very large mamma. A third operation was now undertaken by Mr. Allan, and so extensive was the dissection, that the wound was as large as the crown of a hat. In a few weeks it healed perfectly; but the tumour appeared again in seven months. The late Mr. John Bell was then consulted, and performed a fourth operation upon it—the tumour at the time being as large as the head of a child eight years old. Several months after, the diseased mass was reproduced, and from the surface a fungus sprouted, in shape and size resembling a large cauliflower. This, Mr. Allan removed by ligature, and the patient for the time was relieved. His constitution, however, was completely ruined, and although he lived for several months afterwards, he died at last quite exhausted by the long-continued discharge from the fungus—nearly eight years having elapsed from the time of the first operation. This case plainly shows how little we are to expect from extirpation; and it only remains to say that nothing less than amputation of a limb, when the disease happens to be so situated as to admit of it, will afford any chance whatever of saving the patient's life, and that even this resource is frequently unavailing—owing to the stump assuming the same morbid action, or to a thorough contamination of the internal organs.

An interesting case of fungus hæmatodes of the neck, which occurred in my practice twelve years ago, well calculated to illustrate the foregoing remarks, and some other particulars may be introduced into this place, from the twenty-sixth number of the *American Journal of Medical Sciences*, 1834, as drawn up at that period by myself.

“George Washington Reynolds, seventeen years of age, came to Philadelphia from Delaware in November, 1832, and placed himself under the care of Dr. Horner, on account of a tumour of the size and shape of a cocoa-nut, which occupied the whole of the right side of the neck. See Plate VIII. Dr. Horner referred



Drawn from Nature by W. Gibson.

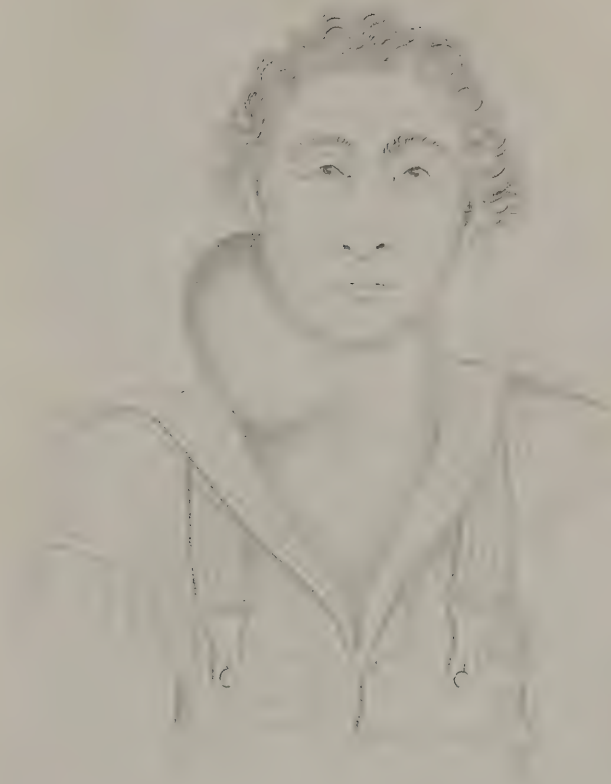
Engraved by C. Tichburt.

him to me, and at the same time requested the opinion of Dr. Physick on the case. The friends of the patient stated that the swelling had made its appearance five years before, that it arose without evident cause, and had gradually increased to its present magnitude. The boy now sought relief on account of the difficulty of breathing and of deglutition he experienced, and which increased with the growth of the tumour. In other respects he felt no inconvenience from it; his complexion was florid and healthy, and his constitution apparently sound and vigorous. In consultation, it was determined that nothing less than extirpation would afford a chance of recovery, and I was requested to undertake the operation. Previously, however, I thought it advisable to reduce the patient by blood-letting, low diet, and other antiphlogistic means, both to diminish hemorrhage, and to guard against inflammation. Having fulfilled these indications, I commenced the operation—November 20,—assisted by Drs. Horner, and J. R. Barton, in the theatre of the Almshouse Infirmary, in presence of several hundred students. The patient was placed, at full length, on a narrow table, his head inclined to the left side and supported by a pillow. An incision two inches long was made over the course of the carotid, low in the neck, and that vessel tied by a single ligature. Over the most prominent part of the tumour, commencing immediately under the angle of the lower jaw, and extending nearly seven inches, another incision was made through the integuments; continuing the line thus chalked out, layer after layer of condensed cellular membrane, of fasciæ and the fibres of the platysma myoides, were successively divided, as well as those of the sterno-mastoideus, which last muscle was spread out by pressure of the tumour and converted into a thin muscular expansion, intimately incorporated with the platysma, and rendering it difficult to distinguish one from the other. During this stage of the dissection the internal jugular vein was exposed, tied by two ligatures, and divided between them. The ends of the vein were then dissected from the surface of the tumour and turned to one side. In order to get round the tumour, and raise it from the cavity in which it was deeply imbedded, it became necessary to separate the integuments, fascia, platysma, and other coverings. This proved very difficult, and was not accomplished without great risk, owing to the distribution of the par vagum and descendens noni nerves, both of which lay on the surface of the tumour, and were closely

attached to it. I soon found it was impossible to get out the tumour, and at the same time preserve the descendens noni. I therefore cut it across. Instantly a slight shudder passed over the patient's frame; but the effect was momentary. I determined, however, not to divide the par vagum—dreading the result either immediately or remotely. I was obliged, therefore, to dissect along the edge of the nerve for five inches, and succeeded in detaching it from the tumour, to which it had formed a very close adhesion. This was the most painful and difficult part of the operation, and nothing but the uncommon composure and fortitude of the boy, perhaps, enabled me to accomplish my purpose—for he remained during the whole operation motionless, and neither complained, sighed, nor groaned. The par vagum having been thus pushed aside and out of danger, I continued the dissection, taking up occasionally small vessels, sometimes separating with the handle of the knife the adhesions between the tumour and a firm fibrous sac, in which I now found it enclosed, at other times using the edge of the knife until I reached the base of the tumour, which was intimately connected with the pharynx and œsophagus, and to remove it from which required every possible precaution. In this, also, I at last succeeded, though not without the division of four or five vessels which at first shed blood freely, but were soon tied, or shrunk of their own accord. The action of the pharynx and œsophagus was distinctly seen, even at a distance, whenever the boy imitated the action of swallowing, or took fluid by the mouth. The cavity left by the tumour was even larger than had been anticipated, owing to the influence of pressure upon all the surrounding parts. To guard against return of hemorrhage, the patient was left on the table for twenty minutes, and the edges of the wound held together temporarily. No hemorrhage occurring, the wound was dressed regularly by adhesive straps, &c., and the patient put to bed. The operation lasted thirty-four minutes.

The tumour having been cut open and examined in presence of the class, was found to consist of a medullary-like matter, of rather firmer texture, however, than that usually met with in fungus hæmatodes. The idea was at once impressed upon my mind, and for the first time, that such indeed was the nature of the disease. The unusually healthy appearance of the boy, and in particular his florid complexion,—circumstances so uncommon in fungus hæmatodes, which is almost invariably accompanied

Plate VIII



by a sallow, cadaverous, countenance,—had prevented any of us from entertaining suspicion of the kind. There was not, moreover, the elastic feel, and deceptive sensation of fluctuation, so characteristic of fungus hæmatodes.

22d. Slight cough and fever, tongue furred.

23d. Pulse and cough increased. Patient kept on barley-water.

24th. Slight uneasiness of chest; no increase of fever, and little thirst; tongue very red with white scurf.

25th. Redness over the whole abdomen, resembling erysipelas, but no pain; administer enema.

26th. Redness of abdomen diminished after injection.

27th. Redness gone; wound partially united, but suppurating abundantly. Barley water continued.

28th. No fever. Tongue nearly natural.

29th. Wound closed, except where ligatures emerge.

December 1st. Patient complains of being starved; barley-water continued notwithstanding.

8th. Diet increased to tea and bread, morning and evening.

11th. Small ligature came away from corner of wound under ear.

22d. Ligatures pulled away from veins.

27th. Ligature from carotid came away.

January 3d. Wound entirely healed, and patient discharged, apparently in good health.

Some weeks afterwards the boy returned to town with a tumour, half the size of the original one, occupying the same situation. The cicatrix had ulcerated, and there was discharged from the opening, a sanious, ill-conditioned matter. Fungus, also, was presented at the opening, and seemed to extend within the interior of the swelling. The patient's countenance was pale and ghastly, his skin of a waxy-yellowish hue, and his body emaciated. I saw nothing more could be attempted for his relief. It was evidently a case of fungus hæmatodes. He was advised to return home, and shortly afterwards died in a dreadful condition.

Remarks.—There are two points connected with the operation just detailed, which give it an interest it might not, in other respects, perhaps, be entitled to—the application of a ligature to the internal jugular vein, and the division of important nerves. It is an opinion generally received among surgeons, that large veins cannot be tied without great risk of inflammation of

their internal surface speedily following, and proving fatal by extending to the heart. Such certainly has been the result in numerous instances in European practice, but it is equally certain that the occurrence in this country is extremely unusual, for out of a great many instances in which I myself have tied varicose saphenæ veins, and have seen the operation performed by others, I have never met with a single case of injury, much less of death from such a cause. The only instance, indeed, that has ever come to my knowledge of death from tying the saphena vein, occurred a few years ago in this city in the practice of a respectable surgeon. There were circumstances, moreover, connected with that case, which rendered it very doubtful whether the unfavourable issue was owing to the operation, or to other causes. I think it very probable, therefore, that the constitutions of patients in this country,—owing to all classes of people being well fed and clothed, and little exposed to hardships,—are generally superior to those of Europeans, and as such more capable of resisting the operations of injury or disease. Whether this be true or not, however, it is certain, judging from the details published by European writers, that the patients that have fallen a sacrifice to phlebitis, occasioned by the ligature of veins, have very generally been among the lowest classes, whose constitutions were of the worst kind, and whose operations were performed in the crowded hospitals of large and unwholesome towns. I do not wish to be understood, however, to say that there is no danger from including a large vein in a ligature. On the contrary, I am well persuaded that there is always more or less risk—much greater risk, indeed, than would follow the tying of a large artery. I only mean to imply that there is less danger in tying a vein than is commonly imagined. Influenced by this opinion, I ventured in the case I have related above, to tie the internal jugular in two places. There are only a few examples on record, I believe, in which this vein has been tied, and most of them had a successful termination. The operation was first performed, there is reason to believe, by Dr. Simpson of St. Andrew's, in Scotland, eighty years ago, and the patient recovered without a bad symptom. Mr. Simmons of Manchester, in England, also tied up the internal jugular and with a similar result. Giraud has recorded a case in which a French surgeon at Toulouse, tied the trunks of the common carotid artery and internal jugular for a wound from a musket-ball. The patient had no

unfavourable symptoms as far as the sixth day; but it is not stated whether the man recovered. In this country the internal jugular has been tied by Dr. Stevens, of New York, and by Dr. Morgan of Auburn; by the former in 1828, and by the latter in 1833. Both patients recovered. Some interesting remarks on the ligatures of veins, in which cases and experiments have been detailed, have been published by Trousseau, and may be found in the 14th volume of the "*Archives Générales de Médecine.*" The author is induced to conclude that there is less danger from tying a vein than is commonly imagined, and that the danger is often owing to prematurely pulling the ligatures away, and other mismanagement on the part of the surgeon. Fatal cases of wounds of the jugular veins have been reported, and the death of the patients attributed to the introduction of atmospheric air.

The division of the descendens noni, in the case of Reynolds, produced little or no inconvenience, it will be seen, to the patient; owing, no doubt, to this nerve being chiefly destined to supply the muscles of the neck, and holding no important connexion with the vital organs. The dissecting up the par vagum, by which it was more or less disturbed, probably gave rise to the erysipelatous inflammation of the abdomen—this nerve having an intimate relation to the stomach, intestines, &c. A division of it during the operation would probably have produced great disturbance in the animal economy, or have led, remotely, to the patient's death. The only further remark I deem it necessary to make in relation to this case is, that could I have known the tumour to have been of the nature of fungus hæmatodes, I should certainly not have undertaken to remove it—upon the ground that there is not a single well-attested case on record in which this inveterate malady has been successfully removed by *extirpation*, and very few where the patient has recovered after amputation. Many other cases that have occurred in my own practice and in that of Dr. Physick, I might also relate in proof of the correctness of the positions advanced in this section; but these I must reserve for the lectures.

See Pott's Works, vol. iii. p. 223; Burns's Dissertations on Inflammation, article Spongoid Inflammation, vol. ii. p. 132; Hey's Practical Observations in Surgery, p. 239, 3d edit.; Abernethy's Surgical Works, vol. ii. p. 56, article Medullary Sarcoma; Wardrop's Observations on Fungus Hæmatodes or Soft Cancer, in several of the most important Organs of the Human Body; Langstaff's Cases of Fungus Hæmatodes, in vol. viii. part i. of Medico-Chirur-

gical Transactions, p. 272; Langstaff's Cases of Fungus Hæmatodes, Cancer, and Tuberculated Sarcoma, in vol. ix. part ii. of Medico-Chirurgical Transactions; Roux's Journey to London, p. 189; Boyer's Treatise on Surgical Diseases, by Stevens, vol. i. p. 318, article Bloody Fungus; Scarpa on the Eye, by Briggs, 2d edit.; Stevens's Cases of Fungus Hæmatodes of the Eye, in the New York Medical Register, p. 117; C. Bell's Surgical Observations, article Soft Cancer, p. 365; Delpach's Précis Elementaire des Maladies Chirurgicales, tom. iii. p. 480; Baillie's Morbid Anatomy; Travers's Synopsis of Diseases of the Eye; Carswell's Illustrations of Elementary Forms of Disease, London, 1833; J. I. Lobstein, Anat. Patholog.; James Copeland, Dict. of Practical Med.; Kerr, in Cyclopaedia of Practical Med.; Andral, Anat. Patholog.; Dupuytren, Leçons Orales; Hodgkin, in Med. Chirurg. Transact. vol. xv.; Middlemore on the Eye, vol. ii.; Cruveilhier, Anat. Patholog., tom. i.; Sewall's Case of Fungus Hæmatodes in American Journal of Medical Sciences, vol. vi. p. 301.

SECTION XII.

GONORRHŒA.

GONORRHŒA, or at least a purulent discharge from the urethra, may be considered a disease of very ancient date; for we find it expressly enjoined in the Levitical law,* that "*when any man hath a running issue out of his flesh,*" or a γονορροια, as the Septuagint terms it, he must be secluded or restrained from sexual intercourse, in order to prevent contamination. It is still a matter of doubt, however, whether the disease now termed *virulent* gonorrhœa, was implied in the passage referred to, or merely that discharge from the urethra which often takes place without the application of any morbid poison, arises from irritation, severe exercise, fluor albus, immoderate use of the genital organs, and known to surgeons under the name of *simple* gonorrhœa. But these are matters of very little importance at the present day, except as regards the question—whether gonorrhœa and syphilis be of the same or of a different nature.

The symptoms of the *virulent* gonorrhœa are a slight titillation or uneasiness of the glans penis, a pouting or tumidity of the

* See Patrick's Commentary on the Third Book of Moses, Chap. xv. p. 245—also Clark's Commentary on the Bible, xvth chapter of Leviticus.

lips of the urethra, more or less redness or inflammation about the prepuce and glans, together with a general fulness of the whole penis. These are soon followed by a discharge from the urethra, of a thin whitish fluid, at first resembling common mucus, but speedily changing into a thick, tenacious, purulent matter, of a yellow colour and peculiar smell. Considerable pain is now felt along the urethra and perineum, the urine is discharged in a thin wire-like or forked stream, accompanied with a burning heat or severe scalding. By this time the inflammation attains a considerable height, the glans penis becomes swollen, tense, of a bright red colour, and its surface has a peculiar shining aspect, as if glazed or highly polished. The pain and *ardor urinæ* are increased in proportion as the inflammation rises, and the colour of the discharge, from the same cause, changes from a deep yellow to a greenish tint. Oftentimes the glans penis is excoriated, and there is a copious discharge not only from the urethra, but from the whole internal surface of the prepuce. These are the ordinary symptoms of the complaint; they are liable, however, to be more or less modified by peculiarities of constitution and by other causes; hence we find some patients to suffer immensely, whilst others experience very little inconvenience during the whole course of the disease.

A very painful affection frequently accompanies gonorrhœa—known by the name of *chordée*. This consists of an involuntary erection of the penis, which generally occurs at night, while the patient is warm in bed, and is so severe as to prevent sleep. It arises during the height of the inflammation, and is always one of the most troublesome symptoms that the patient has to contend with. The penis is drawn downwards or bent into a semicircular shape; and if the inflammation runs high, and the erections continue to recur repeatedly, coagulable lymph is effused into the cells of the corpus spongiosum, the sides of which are agglutinated in such a way as to prevent the future distention of the cells, to an extent equal to that of the corpora cavernosa, and the penis ever afterwards, during erection, remains crooked and deformed.

There are other symptoms also which occasionally take place during the violence of the inflammation. These are a frequent and irresistible inclination to pass urine, owing to the inflammation having extended along the whole course of the urethra as far as the bladder. So severe is the pain in some instances

from this cause, that the patient is afraid or unable to evacuate a single drop of urine, and a total retention ensues, which adds greatly to his distress. From the bladder the irritation extends to the rectum and adjoining parts; a tenesmus takes place, and becomes exceedingly severe and troublesome; there is an acute lancinating pain shooting from the neck of the bladder above the pubes; the small glands along the track of the urethra, whose ducts open into that passage, are enlarged, and sometimes suppurate and discharge externally through the skin. The glands of the groin likewise are frequently affected in a similar manner, and the vas deferens, testicles, ureters, and kidneys often sympathize with the inflamed urethra and bladder.

But of the sympathetic affection of these different organs, that of the testicle, known by the name of *hernia humoralis*, is the most common. It usually occurs about the decline of gonorrhœa, and frequently after the inflammation and discharge have entirely ceased. At other times it takes place suddenly during the height of the inflammation, and then the discharge as suddenly ceases, and the pain leaves the urethra and fixes upon one or both testicles, which "seem," as Mr. Hunter has expressed it, "in many cases rather to be acting for the urethra than for themselves, an idea applicable to all sympathies." Generally, however, only one testicle is affected at a time, though the transition of the disease from one to the other is often extremely rapid. In either case, there is first a soft, diffused swelling of the testicle, which soon becomes hard and very painful. The hardness is most remarkable at the epididymis, and the pain from that part extending up the cord and along the loins, frequently so acute as to induce rigors, fever, sickness of stomach and great derangement of the digestive organs. These symptoms may continue for a considerable time, and give rise to permanent enlargement of the testicle, or they may disappear in a few hours or days, as suddenly as they were induced, without the organ having sustained any injury. In general the swelling diminishes in proportion as the discharge from the urethra is increased, and when it is fully established entirely disappears.

Women are not so liable to gonorrhœa as men, nor do they suffer as much from it—owing to the insensibility of the vagina compared with that of the urethra. It is not easy, indeed, in every instance to determine the existence of the disease in a female, so slight is the pain and so equivocal the discharge;

though I have met with several cases, in which the inflammation ran so high and produced such intolerable anguish, that the patients were unable to leave their beds. Gonorrhœa has often been confounded with fluor albus; but close attention to the symptoms peculiar to each complaint will be sufficient, in general, to distinguish them.

There can be no doubt that a disease bearing all the marks of ordinary gonorrhœa, is the result of intercourse, in many instances, with leucorrhœal women, or with such as happen at the time of connexion to have the catamenia upon them. Excessive coition, mechanical injuries to the penis or vulva, or stimulating injections to the urethra or vagina, may produce the same effect—as is proved in the case of young girls or children upon whom rape has been committed. Swediaur, Cullerier, Ratier, and others have furnished evidence of the kind.

Most violent inflammation, or even total extinction of sight, has followed the accidental application of gonorrhœal matter to the eye. I have met with several cases of this description, two or three of which originated from the patients washing the eye with their own urine, (while they laboured under gonorrhœa,) in order to relieve a common inflammation of that organ—a practice exceedingly frequent among the vulgar. The disease will be further noticed under the head of *ophthalmia*.

Gonorrhœa may terminate spontaneously, or “wear itself out,” or else degenerate into a disease commonly known by the name of *gleet*; which is characterized by the discharge from the urethra of a white, limpid mucus, destitute of virus; and proceeds from a relaxation or debility of the lining membrane of the passage—a consequence very apt to follow inflammation of all mucous membranes. Such at least is the account usually given of the disease by writers, though I very much question the accuracy of their statements; and am inclined to believe that the discharge denominated gleet, is, in most instances, in truth, a *chronic* gonorrhœa, and as such capable of communicating infection. There is also a mucous discharge from the urethra attending other diseases of that passage, particularly *stricture*, which I am persuaded is often considered a gleet, and treated accordingly; but this is certainly not infectious, and differs widely from the discharge which follows a gonorrhœa.

TREATMENT OF GONORRHŒA.

The remedies for gonorrhœa are *constitutional* and *local*. The former are chiefly indicated in the commencement or during the height of the inflammation, while the latter may be employed at any stage of the disorder. In severe cases and in plethoric habits, blood-letting, purgatives and low diet will generally all prove necessary. Considerable experience, however, in the treatment of this disease has taught me, that steady purging is more to be relied on in lessening the inflammation and in removing pain, than even copious depletion by the lancet. Repeated and small doses of jalap or rhubarb, combined with the supertartrate of potash, I have found extremely useful; indeed, in many cases I have prescribed the cremor tartar alone in such quantities as to produce both purgative and diuretic effects, and continued it steadily for two or three weeks with the greatest advantage, after most other remedies had failed. Besides purgatives, stimulating diuretics often prove highly serviceable, both in the inflammatory and chronic stages of gonorrhœa. The *balsam copaivæ* is more decidedly beneficial than any other remedy of the class. It had long been used in the advanced stages of gonorrhœa, but Dr. Chapman was the first to prescribe it during the height of the inflammation, or from the very commencement of the attack. So far back as the year 1806, I well remember to have heard him express his decided conviction of the superior efficacy of the remedy when thus administered. Dr. Armstrong, in his work on scarlet fever, speaks of the practice as novel, and seems to attribute its introduction to a Dr. Dawson, who, it is stated, had prescribed the medicine with great success for more than twelve years, in the very commencement of virulent gonorrhœa. Dr. Chapman's claim to priority, however, is most unquestionable. For many years past I have employed the remedy very extensively, both in the recent and advanced stages of the complaint, sometimes with most decided effect, but in other instances without the slightest alleviation of the symptoms. This may have proceeded from the bad quality of the medicine, which, it is well known, is often ruined by adulteration. The *cubebs*, another stimulating diuretic, formerly much employed in the treatment of gonorrhœa, has been highly extolled as possessing very superior powers. From numerous

trials, however, I am inclined to believe that its virtues have been greatly overrated. A combination, however, of this article with alum, lately introduced by Ricord, is extolled by Matthien,* and by Frederic, of Leipsic, as possessing very extraordinary powers. Two ounces of cubebs, carefully mixed with half an ounce of alum, divided into nine powders, one of which is to be taken three times a day, is the formula prescribed by these practitioners.

Within the last few years, tincture of *iodine* has been extolled by Richond† as a most valuable remedy in gonorrhœa, particularly when employed after full effect has been derived from low diet, leeches, &c. *Demulcents*, by blunting the acrimony of the urethral discharge and by exciting the action of the kidneys, are always used with advantage in gonorrhœa, and should never be neglected. Internally, also, the liquor potassæ is in very general use, either alone or combined with aperients.

The *local* remedies for gonorrhœa may be applied either to the penis itself, or to the urethra. For several years past, I have been in the habit of prescribing a warm bread and milk poultice in the very commencement of the disease, and always with the utmost advantage. To derive full benefit from the application, the prepuce should be retracted, and the glans penis completely buried in the poultice, which should be as warm as the patient can bear it, and renewed as often as it becomes cold and stiff. By persevering in the use of the poultice for a few days, all the symptoms are mitigated, and the way paved for mild and warm injections—such as rose-water, thin solutions of gum Arabic, flax-seed or opium, weak decoctions of oak bark, &c. These check the discharge gradually, and often effect a cure. As the ardor urinæ and discharge diminish, more astringent injections may become necessary. Those commonly employed are solutions of the acetate of lead, of white, green, and blue vitriol, alum, borax, &c. They are all inferior, however, to a solution of the *nitrate of silver*, a medicine that has been strenuously commended lately in the cure of every stage of gonorrhœa, but which I have used extensively for the last twenty-one years, and with the greatest success. By commencing with two grains of the caustic to an ounce of water, and gradually increasing the strength of the solution until the patient feels it sen-

* Journ. des Connaiss. Med. Chirurg. 1840.

† Annales de la Médecine Physiologie, 1827.

sibly, a cure may be produced in a very short time. Some surgeons commence with twenty grains to the ounce; but great irritation, suppression of the discharge, and swelling of the testicle have followed the practice. In some instances, I have derived considerable advantage from the caustic, when mixed with oil and introduced into the urethra on a small bougie. The *nitric acid*, properly diluted, was a favourite remedy with Vigaroux, an eminent French surgeon. Dr. Physick has also employed it very successfully in several obstinate cases of gonorrhœa. The vinous tincture of opium I have often used with great advantage in the early stages of gonorrhœa. At first it should be considerably diluted, but afterwards it may be used pure.*

As *chordée* is one of the most troublesome attendants on gonorrhœa, it should be checked as soon as possible. Camphor, combined with opium, and given in large doses, will be found singularly efficacious in arresting its progress. Sir Benjamin Brodie, for the same purpose, commends the wine of colchicum.

* Any of the following formulæ of injections may be employed in the early or inflammatory stages of gonorrhœa.

℞ Liq. plumb. acetat.	. . . .	gutt. vi
Aquæ distillatæ,	. . . .	℥iv
M.		
℞ Liq. plumb. acet.	. . . .	gutt. vi
Opii purif.	. . . .	℥i
Aquæ distillatæ,	. . . .	℥vi
M.		
℞ Zinci acetatis,	. . . .	grs. x
Aquæ distillatæ,	. . . .	℥vi
M.		
℞ Zinci sulphatis,	. . . .	grs. iv
Aquæ distillatæ,	. . . .	℥v
M.		
℞ Acidi muriatici,	. . . .	gutt. x
Aquæ distillatæ,	. . . .	℥v
M.		
℞ Acidi nitrici,	. . . .	gutt. xij
Aquæ distillatæ,	. . . .	℥vi
M.		
℞ Vini Opii,	. . . .	℥i
Aquæ distillatæ,	. . . .	℥iij
M.		
℞ Balsami copaivæ,	. . . .	℥i
Mucilaginis acaciæ,	. . . .	℥ss
Aquæ rosæ,	. . . .	℥vi
M.		

Hernia humoralis being generally dependent upon suppression of the urethral discharge, induced by irregularities, debauch, the use of strong injections,—the first object of the surgeon should be to re-establish the running. This may often be accomplished by warm poultices, large enough to cover the whole penis and testicles, or by the introduction of a bougie into the urethra. With this treatment, general and local blood-letting should be combined, together with purgatives, while the patient is confined to the horizontal posture, and the testicles supported by a bag truss or handkerchief.

For the relief of the *irritable bladder* and *rectum*, I know of no remedies so effectual as the warm bath, opiate glysters, and warm poultices of fomentations to the perineum. Sir Benjamin Brodie extols, in such cases, hyosciamus, conium maculatum, and wine of colchicum.

Gleet, when it really proceeds from gonorrhœa, and is not connected with stricture of the urethra, will generally be benefited or cured by stimulating injections,* blisters to the perineum, the internal use of cantharides, the muriated tincture of iron, tincture of cubebs, and by the introduction of plain or medicated bougies.

The remedies for gonorrhœa in *women* do not differ from those required for men, except in being used stronger or in larger doses.

* The best injections for gleet are those composed of the sulphate or acetate of copper, of the supersulphate of alum, of the oxymuriate of mercury, of the ammoniuret of copper, &c. Any of the following formulæ will frequently answer, and if one fail, another should be tried.

℞ Cupri sulphatis,	. . . .	grs. ij
Aquæ distillatæ,	. . . .	℥viiiij
M.		
℞ Æruginis præparatæ,	. . . .	grs. x
Olei amygdalæ,	. . . .	℥iv
M.		
℞ Aluminis supersulphatis,	. . . .	grs. iv
Aquæ distillatæ,	. . . .	℥iv
M.		
℞ Liquoris cupri ammoniati,	. . . .	gutt. xx
Aquæ rosæ,	. . . .	℥iv
M.		
℞ Liquoris hydrarg. oxymuriatis,	. . . .	gutt. iiij
Aquæ distillatæ,	. . . .	℥iv
M.		

Consult Hunter's Treatise on the Venereal Disease, by Adams, p. 58, London, 1810; B. Bell's Treatise on Gonorrhœa Virulenta and Lues Venerea; Swediaur's Practical Observations on Venereal Complaints; Adams on Morbid Poisons, 2d edit.; Sawrey's Inquiry into some of the Effects of the Venereal Poison, 1802; Carmichael's Essays on the Venereal Diseases which have been confounded with Syphilis; Carmichael's Observations on the Symptoms and Specific Distinctions of Venereal Diseases; Jeffrey's Practical Observations on Cubebs, London, 1821; Johnston and Bartlett's Report of Cases of Gonorrhœa, in Edinburgh Medical and Surgical Journal, vol. xiv.; Robertson's Remarks on the Internal Use of Cantharides in Gleet, &c., in Edinburgh Medical and Surgical Journal, vol. ii. p. 134; Wallace on the Venereal Disease and its Varieties, London, 1833; P. L. Ricord, *Traité Pratique des Maladies Vénériennes*, Paris, 1838.

SECTION XIV.

SYPHILIS.

It may, perhaps, with truth be said, that previous to the time of the illustrious Hunter, no very accurate views were entertained respecting the nature of syphilis or lues venerea. This great pathologist, aware of the confusion and obscurity in which the disease had been involved from loose and fallacious descriptions of its symptoms, and of the ill consequences which often resulted from confounding affections in reality very opposite to each other, endeavoured to establish the true character of the venereal ulcer, as contra-distinguished from other ulcerations to which the genitals had been subject from time immemorial. The fidelity of his details and accuracy of his distinctions have been amply acknowledged by most subsequent writers; within a few years, however, new facts have accumulated, or at least forms of disease apparently new have been brought forward, which, if admitted to be strictly venereal, are calculated to subvert all former distinctions, and in defiance of precepts founded upon data supposed to be firmly established, are likely to involve in utter confusion and perplexity all knowledge of the disease or of the method of cure. But fortunately, many of Mr. Hunter's facts, and the inferences which he drew from them, are confirmed and supported, unintentionally, by the advocates

of the new-fangled doctrines and the promulgators of new diseases. Most of these diseases, it is well known, have been described with great precision and accuracy by Celsus, in his chapter "*de obscænarum partium vitiis*," upwards of twelve centuries ago, and long before syphilis was known to exist. That the venereal disease appears now under the exact forms described by Mr. Hunter, I shall ever be firmly persuaded, so long as I observe the symptoms and appearances daily met with in patients, to correspond with his descriptions. What changes the disease may have undergone in Europe, I cannot, from sufficient experience, say; but in this country, so far as numerous opportunities of treating it can be depended on, I have no hesitation to declare, that the old-fashioned chancre, so minutely and accurately portrayed by Hunter, is exceedingly common and may be seen at any time in full luxuriance. These remarks are not made to invalidate the statements of the respectable European and American writers, who contend for the existence of a plurality of venereal poisons, but merely to express a belief, that diseases resembling syphilis, and often confounded with it, are by no means unfrequent; and that genuine syphilis, as it was understood by Mr. Hunter, is still known, however modified occasionally by peculiarities of constitution, climate, &c. Under this impression, I shall proceed to treat of the primary symptoms of syphilis, commencing with chancre.

Chancre, or the true syphilitic sore, usually begins with a slight redness or inflammation on some part of the genital organs, attended with pruritus or itching. This itching is soon converted into pain, and a pimple is in a short time formed, filled with pus, which upon bursting leaves an excavated ulcer of a circular shape, with hard and abrupt edges, and a surface coated with a gray tenacious matter. The base of the ulcer is thickened and indurated, and the parts surrounding it for some distance converted into a tumour so distinct and circumscribed, that it may be elevated by the fingers, and feels like a hard and moveable body beneath the skin. This description will particularly apply to chancre when seated on the glans penis; some variation is observable, however, when the prepuce or frænum is affected. In such cases the inflammation is generally higher, the pain more considerable, and, instead of a regular pimple filled with matter, the chancre often follows directly a slight excoriation or abrasion of surface. When seated on the common skin of the penis or

scrotum, the matter discharged from the sore soon dries and forms a scab, which quickly drops off, and is succeeded by another of larger size. Wherever situated, chancre commonly preserves certain general features that serve to distinguish it from common sores, the edges of which are usually smooth and shelving—while those of chancre are jagged and vertical. But, perhaps the most characteristic sign of genuine primary syphilitic ulceration is the *indurated* base; and so long as this continues, even although the sore may have healed, little doubt will remain of the presence of disease.

Chancres may occupy any part of the surface of the body, but they occur more readily on mucous membrane than on the common skin. When situated on the penis, they are usually met with along the frænum, behind the corona glandis, in the mouth of the urethra, or on the internal surface of the prepuce. Ricord, indeed, contends that chancre may occupy any part of the urethra, and not unfrequently lays the foundation of stricture. Among females, the parts commonly attacked are the labia, the nymphæ, and the entrance of the vagina; though, not unfrequently, very large and virulent chancres appear on the perineum, the outside of the labia, near the anus, or on the hip. Sometimes the lips, eyelids, or edges of the nostrils are covered with chancres—from the inadvertent application of syphilitic matter by the fingers. The fingers, themselves, if their extremities be pricked or sore, may suffer from handling chancres, or from delivering infected women.

The period at which a chancre appears after the application of the venereal virus is very uncertain. Sometimes the disease follows in twelve or fifteen hours; at other times several days elapse; and in a few instances no ulceration takes place for two or three months. There is reason to believe that a chancre, so small as scarcely to be perceptible, sometimes exists; and, again, that absorption of the virus now and then follows from the most insignificant scratch, or from an abrasion of the surface of the penis so slight as to escape the patient's notice. So long as the chancre is confined to the penis, or any other part it may happen to occupy, the disease may be considered strictly local; in a greater or less time, however, if not arrested in its progress, the virus extends to the system through the medium of the absorbents, and gives rise to secondary symptoms. The first evidence of its approach towards the system, is generally an en-

largement of the lymphatic glands in the vicinity of the sore, known by the name of bubo.

Besides the common form of chancre I have described—that with indurated base—there are several varieties of syphilitic sore, which present appearances so entirely different from those of Hunterian chancre as to require notice. It may be premised, however, that many of these external characters depend, so far as my observation extends, upon peculiarities of constitution, and more especially upon peculiar organization, or conformation of the glans and prepuce. Thus the indurated base and jagged edge are more common in persons who have the prepuce short and the glans exposed and hardened, whereas spreading, irritable, and flat ulcers are commonly found among those who have a very long, baggy prepuce, and the glans tender and succulent, like an over-ripe cherry—a conformation by-the-by, more common than any other. From this cause many persons suffer immensely, both from chancres and gonorrhœa, and there is reason to believe that if circumcision were generally practised the serious consequences resulting from syphilitic ulceration would be materially lessened. It must be admitted, however, that it is far from easy, even for a very experienced surgeon, to discriminate, in many instances, between chancrous ulcerations and common sores; and this difficulty has been increased by the fact that the hardened base and other apparent characteristic marks may be produced, sometimes, by escharotic and other artificial means. Again, experience proves that sores of the same external character do not invariably produce constitutional symptoms of corresponding feature—with the exception of superficial sores being generally followed by papular eruptions. Indeed, Hennen, Colles, and many other eminent surgeons contend, that it is next to impossible to distinguish with any thing like accuracy, between one chancre and another, or between chancres and simple ulcers. On these points, however, much valuable information may be obtained from the papers of Carmichael, Rose, Guthrie, and other eminent practitioners. In volume second, too, of this work, additional information will be found under the head—Diseases of Penis.

The pus from a chancre is said to differ, in the form of its globules, from common purulent matter; and Donn   contends, that the matter of gonorrhœa and chancre contains animalcules of peculiar form and character, upon whose agency the peculiar effects of these diseases depend—an opinion I have ad-

vanced in my lectures for more than twenty years. According to Ricord the virulency of syphilitic matter is lost as soon as the sore begins to heal; but Colles furnishes a very striking instance to the contrary in the case of a young man, who from marrying a day or two after his chancre had healed rubbed off the cuticle and communicated the disease to his wife. With a view to test the character of a sore on the penis, Ricord resorts to inoculation on other parts of the body, and if a similar sore is produced, considers it syphilitic. The experiment, however, cannot always be relied upon.

Bubo always takes place in those lymphatic glands in the immediate neighbourhood of the chancre, while the deep-seated or remote glands remain uncontaminated, or at least do not enlarge or suppurate. As chancre generally occupies some part of the penis, the glands of the groin are the ones commonly affected. Sometimes several glands are enlarged and form a cluster; but, according to Mr. Hunter, one gland only is usually affected. A bubo does not invariably follow a chancre, and yet the system is not less liable in such cases to contamination. This circumstance, amongst others, has induced some surgeons to believe that bubo does not arise, as is commonly imagined, from the absorption of venereal virus, but from an inflammation in the extremities of the lymphatics excited by the chancre.* Such an idea appears not improbable, and yet it must be recollected that the matter of bubo is infectious, which could hardly happen from simple irritation excited by inflammation. Why the glands, however, contiguous to the sore should suffer while the distant ones escape, is not easily explained; for, upon the supposition of the virus being absorbed, it should follow that, by passing through the whole, all should be equally liable to disease.

Bubo seldom arises from a chronic chancre, but usually makes its appearance soon after the chancre is established. It is more apt to follow a chancre on the prepuce or frænum, than one situated on the glans penis, and is late or early in its appearance, according to the degree of inflammation existing in the sore. Oftentimes a bubo remains stationary for weeks, neither tending towards resolution nor suppuration; in general, however, it is of a bright scarlet colour, exceedingly painful, and quickly runs into suppuration. Occasionally it takes on the erysipelatous inflammation. The ulceration which follows a bubo does

* See Allan's Surgery, vol. i. p. 200.

not differ from that of common chancre, and the matter from it is equally infectious. The bottom of the ulcer is hard and solid to the touch, and the surface either of a dark red or brownish colour or of a yellowish cast.

Very extensive ulcerations now and then follow a bubo. I have seen each groin and the greater part of the pubes laid bare, or entirely divested of integument. In some constitutions buboes degenerate into insensible and very troublesome fistulæ, that resist every application. Sometimes the skin covering a bubo entirely closes, but not uniting with the parts beneath, leaves a hollow, from which in a short time a thin serum is discharged through small holes or pores formed in the skin. In such cases the integuments generally assume a leaden or bluish colour, and have an unhealthy aspect.

Buboes frequently arise from other causes than the absorption of venereal virus—from wounds or injuries of the foot, from colds, fevers, the mechanical irritation of mercurial ointment applied to the leg or thigh of the affected side, from gonorrhœa, &c. Such swellings cannot be distinguished always from the true syphilitic bubo, and much mischief has resulted from severe and unnecessary salivations, under an imaginary idea of venereal taint. The surgeon should, therefore, carefully inquire into the history of every such complaint before he ventures to give a decided opinion respecting its nature.

Ricord, as in doubtful cases of chancre, resorts to inoculation of other parts of the body, and is governed by the result. In a remarkable case from North Carolina I attended two or three years ago with Dr. Edward Peace, one of our most accomplished young surgeons, the character of a long-standing, large, and inveterate ulcer of the groin was completely, by the experiments of Dr. Peace, developed in this way, and the patient speedily cured.

Bubo should be looked upon as one of the primary symptoms of syphilis; for so long as the venereal virus is detained in the glands or their vessels, it may be considered as only on its way to the system. When the lymphatics themselves are inflamed from a chancre, there is usually perceived a hard cord, which runs from the sore along the back of the penis towards the pubes or groin.

The *secondary* or *constitutional* symptoms of syphilis present themselves under several forms, which usually appear in regu-

lar order or succession. The parts first attacked are the throat, nose, mouth, tongue, and skin; and next to these the periosteum, fasciæ, tendons, bones, ligaments, eyes, ears, &c. Frequently the skin is the texture first affected; but the throat, as far as my observation extends, commonly affords the earliest evidence of absorption of the venereal virus. The disease appears in the form of ulceration and usually occupies the tonsils. So slight is the pain in most instances, that the discovery of the sore is often accidental. When examined, the ulcer will be found coated with an ash-coloured, or brownish matter, that gives it a foul or unhealthy appearance, while the surrounding parts are slightly inflamed and tinged with a copper cast. In the advanced stages of the disease the ulcer is excavated, or as Mr. Hunter has expressed it, "dug out." These marks will be sufficient to distinguish it from other ulcerations to which the throat is liable; though in some instances the resemblance to common sore throat is so striking as to deceive the most experienced practitioner. In general, however, there is less inflammation and pain in the venereal sore throat than in the common forms of the disease.

As the ulceration advances, one or both tonsils, the uvula, velum palati, membranous part of the Eustachian tube, and even the epiglottis, may be entirely destroyed—giving rise to permanent deafness and incessant cough, and endangering the patient's life from suffocation, by permitting solids and fluids to enter the larynx. In many instances a communication is established between the nose and mouth—from the ulceration having destroyed the soft parts of the bones of the palate. At other times the disease travels along the Schneiderian membrane, undermines the septum and cartilaginous part of the nose, destroys the periosteum covering the thin and delicate bones, which are soon rendered completely carious, and crumble away, leaving the nose sunk and ruined, the features dreadfully deformed, and the patient in the most loathsome condition, with foul and fetid matter flowing perpetually from the nostrils or into the throat, and a breath so extremely offensive as to render the sufferer hateful to himself and disgusting to his friends.

Venereal eruptions, or cutaneous blotches, do not always possess uniform characters; though the symptoms in general are sufficiently decided to enable us to form a correct diagnosis. In many instances the whole skin becomes discoloured or mottled, or covered by an efflorescence, which is often preceded by general indisposition—such as fever, restlessness, headach. At other

times circular patches appear in distinct spots on different parts of the body, each of which proceeds from an indurated lump of a pale red colour. The patch slowly enlarges, and in a little time its centre is rendered flat and becomes incrustated with whitish scales. These gradually desquamate, and are succeeded by others of a similar appearance, until at last the skin cracks and discharges matter, which soon hardens on the surface and forms a scab of a dark brown or *copper* colour. This seldom extends beyond half an inch in diameter, and after a time drops off and leaves an ulcerated surface, which gradually spreads, deepens, and becomes covered with a thick, fetid, greenish matter. These ulcers are often extremely painful, especially when on the scalp, where they are frequently followed in a short time by caries of the skull.

The parts commonly occupied by venereal eruptions, are the back of the neck, the forehead, breast, and groin. Frequently the palms of the hand and soles of the feet are affected. The extremities of the fingers and toes are also liable to suffer; in which case, the surface beneath the nail becomes red and tender, and the nail soon drops off.

The *periosteum* and *bones* are next in order of contamination. All the bones do not appear to be equally susceptible of impression from absorption of the virus. Those thinly covered by integuments, or situated near the surface of the body, particularly the cranium, clavicle, sternum, tibia, radius, and ulna, are most liable to suffer. The first evidence of the disease having reached the periosteum and bones, is an enlargement or tumour called a *node*, which increases slowly, never attains a very large size, and is seldom painful until it has existed a considerable time. At last, however, the integuments covering the tumour become red and inflamed, deep-seated, acute pain is felt in the part, and extends from it to a considerable distance, often throughout the limbs, especially at night, when the patient lies warm in bed. In a greater or less time the swelling loses its hard and solid consistence, becomes soft and fluctuating, ulceration takes place on the most prominent part, and soon opens a communication with the interior, from which is discharged an ill-conditioned, glairy matter. The bone may now be felt rough and bare, or completely carious. When the node is seated on the skull, both tables are often perforated with numerous holes, and resemble in some respects a piece of worm-eaten wood. Patients who have suffered

from repeated attacks of syphilis, and have taken large quantities of mercury, often have the bones greatly enlarged and thickened throughout their whole extent. When examined, also, such bones are found much heavier than usual. When a node proceeds from inflammation of the periosteum alone, the swelling may frequently be removed entirely: but it seldom wholly disappears, when once the substance of the bone has been involved.

All the secondary symptoms of syphilis are preceded or accompanied by more or less constitutional derangement; but this is oftener observed during the latter stages of the complaint than at any other period. The fever is either periodical or constant, and generally assumes the hectic form. Sometimes, it is so severe and unrelenting as greatly to reduce the patient's strength, producing restlessness, emaciation, diarrhœa. At other times, it seems to be the immediate cause of his death.

Secondary symptoms of every description are distinguished from the primary, in not communicating a specific or infectious disease, similar to that arising from chancre or bubo. This has been proved in the most satisfactory manner, by the experiments of Mr. Hunter. Ricord has recently confirmed Hunter's statements by inoculating with matter of secondary venereal sores, as well as with the blood of syphilitic patients.

Besides the venereal sore throat, blotches, and affections of the bones, there are other symptoms that have been generally considered belonging to the secondary order. These are *venereal* warts, *condylomatous* tumours, *alopecia*, or falling off of the hair, syphilitic ophthalmia or *iritis*, and other affections, some of which are not strictly venereal.

Venereal warts are very apt to follow chancres, and usually occupy the same situations. They arise by a narrow neck or pedicle, and are expanded on the surface—resembling a mushroom. They are sometimes exceedingly painful, and bleed profusely upon the slightest touch. Frequently the whole glans penis or vulva are completely covered by these excrescences. Sometimes they co-exist with chancres.

Condylomatous tumours usually occupy the verge of the anus. They are firm and fleshy, broad at the base, irregular on the surface, and frequently ulcerate and become very troublesome.

Alopecia, does not invariably follow the secondary symptoms of syphilis, even when the system is thoroughly contaminated. In many cases, however, large quantities of scurfs or scales form

about the roots of the hair, which are soon loosened and drop out, leaving the scalp perfectly bare. The eyebrows, also, not unfrequently fall off, and are seldom regenerated.

Iritis, ulceration of the eyelids and destruction of the cornea, may result from the application of primary syphilitic matter; and cases of the kind are reported by Ricord, from opening of buboes, and the sudden injection of the pus into the surgeon's eyes.—See *Ophthalmia*.

It is yet a disputed point whether syphilis ever attacks the fœtus in utero. By most surgeons, however, it is admitted, that secondary symptoms may arise through the medium of placental interchange between the mother and child. In proof of which it may be stated that, either immediately after birth, or the lapse of a few days, copper-coloured blotches appear on the thighs, around the anus and genitals and in the groin, followed by ulcers at the corners of the mouth, on the tongue, and in the throat. The voice of the infant, also, becomes remarkably hoarse, and so husky as to attract the attention of every observer. The whole body soon wastes—almost every fold of skin is cracked and ulcerated, and death speedily takes place. Should the child survive, as occasionally happens, the whole body, as well as face bears striking marks of old age. Hence the denomination of “*petit veillard*” applied to infants thus affected.

There are many diseases which bear a considerable resemblance to the primary and secondary forms of syphilis. These have been described by different writers, under the name of *pseudo syphilis*, and other similar appellations.

The question concerning the identity of syphilis and gonorrhœa, might next be entered upon. Immense difficulties, however, necessarily attend an inquiry of this sort,—especially as the most opposite conclusions have been drawn from experiments performed by surgeons of equal intelligence and respectability. Thus, Mr. Hunter, from experiments made upon *himself*, as now generally understood, and upon other patients with the matter of gonorrhœa and of chancre, was induced to declare that the diseases were essentially the same, but often produced opposite effects—owing to the difference in the nature of the textures to which they were applied. Again—Vigaroux, in support of the same opinion, details the cases of six Frenchmen, who had connexion with the same woman in rapid succession; the first of whom had a chancre, the second and third a gonorrhœa, the

fourth and fifth a chancre, and the sixth a bubo. On the other hand, Mr. Benjamin Bell has furnished an account of several experiments, some of which were performed by medical students upon themselves, with the matter of gonorrhœa and that of chancre,—the former of which was applied to the glans penis both by simple contact, and by inoculation, without producing more than a slight inflammation and discharge from the surface, while the matter of chancre, introduced into the urethra, instead of creating gonorrhœa, produced chancre within the passage. Similar results have been obtained by other surgeons of the first respectability, all of which tend to establish the reverse of Mr. Hunter's position, and to prove that the two diseases are totally distinct from each other. How are such conflicting discrepancies to be reconciled, and with what prospect of success can we enter upon an investigation which seems to have puzzled and defied some of the ablest men that have ever attempted to unravel its mysteries? The arguments on each side of the question, at any rate, are too numerous to be introduced into an elementary work of this description; but I have no hesitation to affirm my belief in the existence of two distinct and separate poisons, each of which is capable of producing effects peculiar to itself. That they may exist simultaneously, moreover, in the same individual, there can, I think, be very little doubt.

TREATMENT OF SYPHILIS.

It is well known, perhaps, that within the last thirty years an attempt has been made by Mr. Carmichael and the British army surgeons to remove the different forms of syphilis without the use of mercury; and in proof of the efficiency of the plan, the results of experiments, made upon the most extensive scale, have been brought forward, and are so well attested as to leave no room to question the accuracy of the details or the correctness of the inferences drawn from them. From an official document, published by Sir James M'Grigor and Dr. Franklin, it appears that nineteen hundred and forty cases of primary venereal ulceration on the penis were cured *without* mercury, between December, 1816, and December, 1818; and that during the same period, two thousand eight hundred and twenty-seven chancres, the greater number of which were characterized by a hardened base,

were cured with mercury. Out of this number the average period occupied in the treatment of chancres, unattended by bubo, by the non-mercurial plan, was *twenty-one* days—those with bubo, *forty-five* days. On the other hand, it is stated, that the chancres unaccompanied by bubo, and treated with mercury, required upon an average *thirty-three* days for their removal, and *fifty* days when conjoined with bubo. From these data the inference is plain, that primary syphilitic sores may be cured in a shorter time *without* the use of mercury than *with* it; and this conclusion has actually been drawn by the advocates of the non-mercurial plan of treatment, whilst at the same time, they acknowledge the utility of mercury under particular circumstances, and admit that certain cases prove obstinate or incurable unless this medicine be employed. With regard to the greater or less frequency of secondary symptoms, after the removal of primary sores treated *by* mercury, or *without* it; the amount of evidence afforded up to the present time is, that such symptoms are most common when mercury has not been employed, but on the other hand, that those troublesome and severe affections of the bones—nodes, caries, &c.—formerly so common, hardly ever follow the non-mercurial course, and that all the other secondary symptoms are milder and more easily subdued when mercury has not been used.

It must not be concealed, however, that there are still respectable and intelligent surgeons, both in Britain and in other countries, who not only condemn the anti-mercurial practice, but doubt the accuracy of many of the statements furnished by the army surgeons; and contend that there is every reason to believe that the patients, supposed to have been cured without mercury, have taken the medicine surreptitiously, employed secretly caustic applications to their sores, or that cures have followed from the mercurial dressings, acknowledged by the army surgeons themselves to have been used in numerous instances. But these inferences and suspicions, it appears to me, are unjustifiable, inasmuch as the cases brought forward in support of the practice are too numerous, and the authority of the surgeons, too respectable to admit of any doubt on the subject.

Whilst it must be acknowledged, then, that the venereal disease, contrary to the tenets of Mr. Hunter, does not become progressively worse and worse unless arrested by the use of mercury, and that complete cures have been effected in numerous instances

by different remedies, yet it remains to be ascertained how far these remedies can with certainty be depended upon, the particular cases to which they are adapted, and the circumstances under which mercury may be dispensed with or administered with advantage. It is true that this has already been attempted, but not upon so sure a foundation as to induce us to lay aside altogether a remedy which we know to possess undoubted sanative powers, and which we have reason to believe will be followed by few ill consequences, if *judiciously employed*.

As *chancre*, in its commencement, must be considered strictly a local disease, local remedies will often prove sufficient to arrest its progress or effect a cure. It is proper, therefore, in every instance, provided the inflammation does not run very high, to touch the sore repeatedly with some escharotic—such as the *lunar caustic* or the *caustic potash*. These lessen the irritability and convert the chancre into a simple ulcer, which speedily heals without contaminating the system. If, however, the chancre has existed for some time previous to the application of the caustic, in all probability no benefit will result, owing to the virus having extended beyond the sore, which indeed, under such circumstances, may be rendered worse, or at least larger, by the caustic.

Many modern surgeons, however, object to the application of caustic for the removal of chancres. Among these may be mentioned Colles and Ricord, the last of whom alleges “that the instant the pus is inserted, the chancre is evolved, and goes on to suppuration; that the induration of a chancre begins on the fifth day, and that this hardness is an indication it has entered the constitution.”* On the other hand, Delpech, the late Mr. Wallace of Dublin, Velpeau, and others equally eminent, commend the practice, and prefer it to excision—so commonly employed by the older surgeons. Velpeau, indeed, contends, that not only has the lunar caustic the power of arresting the progress of syphilis, but of producing the same effect upon the pustule of variola.

It may then become necessary to employ internal remedies, and there are none so effectual, in certain cases, as mercurial preparations. Of these *calomel* and the *blue pill* will be found the most useful. The former may be given alone in the dose of a grain, morning and evening, or in combination with opium,

* Lizar's System of Practical Surgery, p. 275.

which prevents the medicine from passing off by stool; the latter may be administered two or three times a day in the proportion of five grains at each dose. In general the blue pill should be preferred to calomel, inasmuch as it is milder and more gradual in its operation. With particular constitutions, however, it disagrees—owing, perhaps, in some instance, to an improper mode of preparing the medicine.

Conjoined with the internal use of mercury, its application to the skin in the form of inunction will sometimes prove absolutely necessary. Two or three drachms of the ointment should be rubbed on the inner surface of the thighs, every morning and evening by an assistant, until the greater part of it disappears. If pimples or ulcerations arise from the friction, which is often the case, the rubbing should be discontinued or transferred to the legs and arms. Sometimes an inflammation is excited in the course of the absorbents by mercurial friction, from which a bubo arises. Under these circumstances, it must be laid aside immediately.

In no instance can it be necessary to *push* the mercury, as it is termed, either for the cure of a chancre, or any other stage of syphilis. Nothing more will at any time be required than to touch the mouth slightly, or produce a gentle ptyalism. From inattention to this, many patients have suffered immensely, and others have lost their lives. It must not be supposed, however, from any of the remarks above made, that mercury must be used *necessarily*, either in large or small quantities in the generality of cases. On the contrary, many cases are met with where the use of that medicine may be *entirely* dispensed with. Perhaps, then, as a general rule, it may be stated, that the surgeon should endeavour to remove chancres and other primary symptoms of syphilis by the antiphlogistic system and other simple constitutional remedies, and after full trial of these, should the sores remain stationary or spread, that mercury may be then resorted to in the manner already stated.

As *local* applications to the chancre, several articles will prove highly serviceable. The *black wash*, prepared by adding two drachms of calomel to an ounce of lime water, I have used with the utmost advantage. The mixture should be well shaken previous to its application, and the cavity of the chancre covered by the thick powder that afterwards settles at the bottom of the vial. Dry lint sometimes forms an excellent application to a chancre.

Professor Cooper, of the London University, praises the tepid water dressing, with oil silk over it, in ordinary cases; and speaks highly of astringent lotions of sulphate of copper, alum, acetate of lead, &c. When the sore requires stimulating, I have known no articles so useful as the compound ointment of the acetate of lead, the yellow wash, citrine ointment, and the diluted tincture of the muriate of iron. In recent chancres the chloride of soda forms an excellent application. The same may be said of the aromatic wine of Ricord.

Some chancres spread and become extremely indolent, or else are converted into indurated excrescences which occasionally attain a large size and feel like an ordinary scirrhus. At other times the ulcer burrows or creeps from one part of the penis to another, opens the cells of the corpus spongiosum, and gives rise to profuse hemorrhage, and eventually, if not arrested, destroys the penis. In many of these cases I have derived great benefit from the internal use of the *phosphate* of mercury, cautiously administered in doses of half a grain twice a day, and locally from adhesive plasters, which, by drawing together the edges of the sore, often promote their reunion. In a recent communication, Mr. Hugh Carmichael, of Dublin, speaks in high terms of the effect of this local remedy.

To obviate *erections*, which frequently cause the chancre to spread by breaking up the adhesions as fast as they are formed, the use of camphor and dulcamara will be found indispensable. Sometimes chancres, instead of becoming indolent, take on acute inflammation, which may run so high as to terminate in mortification and loss of the penis. In bad constitutions this state is frequently brought about by the operation of mercury. When this happens the medicine should instantly be laid aside, and the patient placed on a low diet, whilst blood-letting and purgatives are freely employed, together with warm poultices to the penis, and opiate and other injections between the glans and prepuce.

Other applications, still more efficacious when the chancre is decidedly of the phagedenic character, are diluted nitric acid, extract of cicuta, and opium in solution, carrot and yeast poultices, fumigation with red sulphuret of mercury and other similar means.

If the chancre is accompanied by *phymosis* or *paraphymosis*, as often happens, we should never think of slitting up the prepuce, during the height of the inflammation, as sloughing would

be very apt to follow, or at any rate the cut edges be converted into chancres. Simple and unimportant as an operation of this kind may appear, I have known mortification and death to follow from it in one instance, which occurred not long since in the practice of a respectable surgeon of this city. The true practice, in all such cases, is to combat the inflammatory symptoms by appropriate remedies.

In spite of all our efforts, it frequently happens, that the disease is not removed, but pursues its course towards the system, and appears next in the shape of *bubo*. To prevent this from terminating by suppuration, blood-letting, purgatives, and other parts of the antiphlogistic system should be resorted to immediately. These, unaided, will often prove sufficient to discuss the swelling, or to procure resolution; but in some instances this purpose cannot be effected until the system is placed under the influence of mercury; and the sooner, therefore, this event can be brought about the better. It may be proper, however, to state, that mercury, when employed in irritable constitutions, instead of resolving a *bubo*, will sometimes cause it to suppurate and to degenerate into a troublesome sore; and again—that the same effect may occasionally arise from the inflammation produced by the mechanical operation of friction, in the act of introducing the mercury into the thigh of the affected side. Whenever there is reason to suspect that inordinate irritation proceeds from either of these causes, the mercury must be discontinued and the patient confined to the horizontal position, in order to keep the parts as still as possible, whilst, at the same time, cold saturnine solutions are applied constantly to the groin; or what frequently answers a better purpose, the tumour may be covered by a *blister*, which has always been a favourite remedy with Dr. Physick, in the early stage of *bubo*. Some surgeons, under similar circumstances, recommend leeches to the swelling. I have known, however, great irritation and troublesome ulcerations to follow from the bites of these animals when applied to the inflamed gland, and therefore seldom prescribe them in such cases.

Should these remedies fail, and suppuration become inevitable, then warm poultices should be applied to the groin until the matter is discharged. Sometimes it happens that suppuration is established, and yet the matter is afterwards absorbed and the skin remains entire. If there is reason to think such an event probable, the poultice should be laid aside, and a simple dress-

ing substituted. On the other hand, when the matter is copiously secreted, and at the same time backward in its approach to the surface, the abscess should be opened by the lancet or caustic. The former I prefer in every instance, as it gives less pain than the caustic and discharges the matter at once. The late Dr. Parrish was in the habit of treating suppurating buboes very successfully, by making a number of small openings through the skin, discharging the matter gradually, and afterwards pressing the sides of the cavity together by a soft sponge or compress.

When ulceration, which frequently follows a bubo, proves obstinate and spreads, the applications recommended for chancre, particularly the *black wash*, should be tried. If the edges of the sore become hard and insensible, they may be pared away with the knife or destroyed by repeated touches with caustic. Indeed, the whole surface of an ulcerated bubo is often rendered so indolent as to require a very liberal use of caustic, savin powder, and other articles equally stimulating.

The treatment of *secondary* symptoms must depend upon the extent of the disease. In general, mercury will not be necessary. There are certain preparations of that medicine, however, which seem particularly adapted to the advanced stages of syphilis.

The *muriate* of mercury or corrosive sublimate, has acquired in this particular a very high reputation, and as I think deservedly; many practitioners, indeed, very much depend upon it throughout every form of the complaint. Mr. Pearson, however, whose opportunities of testing the anti-venereal powers of various medicines have been very extensive, holds it in low estimation, when applied to the treatment of primary symptoms; whilst he admits that it is "peculiarly efficacious in relieving venereal pains, in healing ulcers of the throat, and in promoting the desquamation of eruptions." There are various modes of administering the article, which, if given in large doses and in an improper vehicle, will frequently give rise to excessive thirst, burning in the throat, nausea, vomiting, and other violent symptoms. For several years past I have used the medicine in all the consecutive affections, and frequently with advantage, in doses of thirty or forty drops of a solution, composed of a grain of the salt to an ounce and a half of water, and given two or three times a day. As a *gargle*, also, in venereal sore throat, there is no application more effectual.

Should the corrosive sublimate, internally administered, prove insufficient to touch the mouth or remove the disease, the blue pill and calomel may be resorted to; and if these also fail, there is another mode, and the most expeditious we are acquainted with, of introducing the medicine into the system—by *fumigation*.

This practice was known at a very early period, and indeed employed extensively in every form of syphilis, in preference to the internal use of mercury. It appears at one time to have been abandoned, but afterwards revived by Lalouette, a celebrated physician at Paris, who states, that during the space of thirty-five years, he had cured by means of it, upwards of four hundred patients, after all the ordinary remedies had failed. Upon the recommendation of Mr. Abernethy, I commenced, many years ago, this plan of treatment, and found it greatly to exceed my expectations,—producing in a very short time a decided impression, after the system had resisted, for weeks, or months, the operations of calomel and the blue pill. It is well known, indeed, that there are many patients upon whom these and most other preparations of mercury fail to induce a salivant effect,—which is afterwards brought about very speedily by fumigation. This circumstance has been adduced as an objection to the general employment of the remedy, inasmuch as it is difficult to introduce into the system a sufficient quantity to ensure permanent benefit—owing to the rapidity with which the mercury operates when thus administered.

There are two or three modes of conducting the fumigating process; one of which, and perhaps the most simple, is to seat the patient, who is previously stripped to the skin, in a common arm-chair, and surround the whole body, with the exception of the head and neck, with thick blankets. Beneath the chair is then placed a common iron pot or chafing-dish, full of live coals, and over this a thin sheet of iron, the surface of which, when heated, must be strewed with some mercurial preparation, capable of volatilization. The fumes ascending penetrate the skin in every direction and enter perhaps the lungs. A copious perspiration is usually the result of the operation; and to prevent the patient from taking cold, he should be carefully wrapt in the blankets and conveyed to bed.

Another method, more complicated, and perhaps not more effectual, is to enclose the patient in a box, resembling a sedan-

chair, having an opening at the top to let out the head, and another at the bottom holding a small furnace. The preparations usually employed in either process are factitious cinnabar, the black sulphuret of mercury, or else a gray powder, formed by mixing together four ounces of calomel, two drachms of aqua ammoniæ and six ounces of distilled water. This powder is separated by filter, and dried, and is preferred by Mr. Abernethy to any other in use.

The great advantage possessed by fumigation over the common modes of introducing mercury is, as before mentioned, its speedy operation, which renders it particularly valuable in certain ulcerations of the throat and nose, which are rapidly spreading and threaten destruction to the delicate parts amongst which they are seated. From experience, I can recommend the plan in all such cases, with the utmost confidence. Nor have I found it less effectual in dispelling venereal discolorations of the skin and blotches.

Besides mercurial preparations, there are others equally efficacious in breaking up the remnants of syphilis. These are the mineral acids used singly or conjointly, certain vegetable extracts, particularly sarsaparilla, guaiacum, mezereon, administered in the form of decoction, or mixed with syrups, and generally containing more or less of corrosive sublimate—such as the *syrup* of Cuisiniere, the *depurative ptysan* of Vigaroux, the *rob anti-syphilitique* of Laffecteur, the *tisane of Feltz*, the *decoction* of Zitman; all which, in particular cases, often prove extremely serviceable, in relieving pain, healing ulcerations, or in restoring constitutions enfeebled or injured by the abuse of mercury. Of the acids, the *nitro-muriatic*, as used by Dr. Scott, in the treatment of hepatitis, and by Sir Charles Bell, for secondary syphilitic symptoms, will be found the most convenient and serviceable.

Nodes are often extremely difficult to remove. In general, they are benefited by sarsaparilla, and by external applications, such as the linimentum hydrargyri ammoniatum.* As an internal remedy *arsenic* has been found highly serviceable in obsti-

* The following formula of this medicine will answer for a variety of surgical purposes. ℞. Ung. Hydrargyri fort. Adip. suillæ. præp. sing. ℥i. Camphoræ, ℥ij. Ammoniæ liq. ℥iv. First rub the camphor with a few drops of alcohol, and then with the ointment and lard; and lastly, add by degrees, the liquor ammoniæ; and mix the whole together in a glass mortar.

nate nodes. The late Dr. Dewees successfully prescribed the medicine in such cases for more than thirty years.

Venereal warts may be removed by the knife or scissors, and sometimes by the application of acetic acid, the compound powders of rhubarb or savin, the muriated tincture of iron, butter of antimony, finely levigated arsenic, &c.

The foregoing observations on syphilis and its treatment, embrace many of the important points acknowledged to be established by the best authorities in the profession. There are many doctrines and modes of treatment to which I have not alluded, or, if so, very slightly, because they have appeared to me questionable or speculative merely. I cannot, however, dispose of the subject of syphilis, without making a few general remarks upon the views and practice of my friend, Mr. Carmichael of Dublin, a gentleman who may be said to have devoted a lifetime to the investigation of such diseases, and who has the merit of being the first to revolutionize the opinions of the profession, and to establish upon a solid basis certain leading principles which can now hardly admit of being controverted.

Having had occasion to visit Dublin in 1839, I there formed the acquaintance of Mr. Carmichael, and expressed a desire to learn from him, personally, the views he entertained on syphilis, inasmuch as I had found the profession, both in Europe and America, at variance in regard to the meaning of the statements he had made in his publications. He very obligingly undertook to explain his views; and to make the explanation still more satisfactory, took me through the Richmond and other hospitals, and pointed out numerous cases of primary and secondary forms of disease well calculated to illustrate his descriptions.

He had been among the first, he said, to prove that venereal diseases did not become worse and worse, according to Hunterian tenets, until they destroyed the patient, by treating, in the Westmoreland Lock Hospital, in 1810, numerous cases without mercury, which did not correspond with Hunter's account of true syphilis. That in 1813 he delivered a course of lectures to establish his position; published in 1814 the same views in his work on venereal diseases; in 1815 a paper, in the Medical and Physical Journal, detailing the results of seventy cases treated without mercury, and in other works published in 1818 and 1825: and had thus established a claim to priority, which had, erroneously, been awarded to the late Mr. Rose, surgeon to the

Coldstream regiment of guards, whose paper on the antimercurial system did not appear until 1817. He did not pretend, however, he said, to be the first who ever treated syphilis without mercury, as many, from time immemorial, had entertained similar opinions respecting the injurious effects of that medicine in certain cases; but contended that he was the first, as far as he could ascertain, who had tried the antimercurial plan upon a systematic and extensive scale, and had published the results.

After stating in a general way, the cases to which he believed mercury adapted, and those in which he had reason to believe it would prove injurious, Mr. Carmichael put into my hands a short essay he had just published in the *Dublin Journal of Medical Sciences*, entitled, "A Summary of Mr. Carmichael's Views of the Venereal Cases in which Mercury is admissible or not admissible," from which I shall here give a few extracts, as better calculated to do justice to the author's tenets than any language of mine could convey.

"I reject," says he, "mercury in all forms and stages of venereal complaints except true syphilis, taking Hunter's description for my guide; i. e. the hardened edge and base as indicating the primary sore, and the scaly eruption (from the commencement) as indicating the secondary or constitutional affection. And now I shall briefly detail the exceptions to this, my general rule, and the circumstances under which I am induced to prescribe mercury; first premising, that I seldom or never exhibit it for the primary symptoms, which occasion the papular eruption, viz. excoriation of the glans and prepuce, and an ulcer, in many instances better described by its negative than its positive characters, so much is it likely to be modified by neglect, irritation, mode of living, and constitution of the patient. The negative characters to which I allude are its want of induration and phagedena; for its positive I must refer to my essay, as it would occupy too much space here to detail them. This form of disease, perhaps, amounts at present to nine-tenths of the cases which occur in general practice. Others—for instance, the primary phagedenic ulcer and the constitutional symptoms, rupia, tubercles, &c., connected with it—are far more tedious and difficult to cure, and therefore it is that we find the beds of hospitals filled in an over-proportion with cases of this obstinate form of venereal disease.

"1st. If cases of the simple primary ulcer of the papular ve-

venereal disease do not yield to rest, the antiphlogistic treatment and astringent washes, after the third or fourth week I usually give mercury in alternate doses, in the same manner and with the same views as I would exhibit it for any indolent ulcer which is not venereal; but this is seldom or never necessary.

“2d. When the papular and pustular eruptions become scaly, and obviously on the decline, in general not sooner than the fourth or fifth week, if not yielding satisfactorily to sarsaparilla and antimonials, I exhibit mercury in alternate doses, combined with sarsaparilla.

“3d. Whenever iritis occurs, I give mercury so as to excite its full effects upon the system.

“4th. When nodes arise, which usually commence with inflammation of the periosteum, I also give mercury so as to produce its full effects; and in the last two instances it is exhibited on the principle, that there is no process so powerful in checking periostitis, or inflammation of any membranous part, as mercurialization of the system. It is here worth remarking, that in the course of a long practice, both public and private, I have never met with nodes as an attendant upon the papular eruption; which, in my mind, is an indication that the poison which produces it is different from that which occasions the other forms of venereal eruption.

“5th. In the phagedenic form of venereal disease I may safely say that I have always found, sooner or later, the exhibition of mercury prove to be injurious. For primary ulcers, invariably so, and the same may be observed while the eruption continues to present the form of rupia or tubercles. But after the disease has existed for months or years, each succeeding crop of eruption, I have observed, has a tendency to change its character into that of scaly tubercles, of which there are many excellent drawings in the Museum of the Richmond Surgical Hospital, open to the inspection of all medical men. In this state alternate doses of mercury may, *perhaps*, be of use; yet of this I am very doubtful, for I have seen, even in this exhausted state of the disease, more relapses than perfect cures by mercury, exhibited either in full or alternate doses, under the most guarded and judicious mode of administering that medicine. In such case I place much more reliance upon the administration of hydriodate of potash in conjunction with sarsaparilla. When the presence of nodes indicates the utility of mercury, I restrain myself from its exhibition

should rupia also be present, from experience of its injurious effects on the general disease, under this form of eruption. And even when extensive ulceration of the fauces, engaging the velum, tonsils, and entire pharynx, seems to threaten the life of the patient, I would try every method likely to succeed, before I should have recourse, even to mercurial fumigations, for fear of mercurializing the *entire system*, although well aware of the benefit often arising from their use as a *local remedy*. The local remedies upon which I chiefly rely in checking the progress of this dangerous ulceration, are the application of a strong mineral acid, the white muriate of antimony, a saturated solution of the oxymuriate of mercury in alcohol, or of nitrate of silver in distilled water. While the constitutional remedies upon which I most depend are hydriodate of potash, sarsaparilla, and opium in sufficient doses to relieve irritation. I have found mercury, in every stage of the phagedenic venereal disease to be a most deceitful remedy; for, although symptoms may amend for a brief period under its use, and flatter both patient and practitioner that a speedy cure is at hand, yet, almost to a certainty, new symptoms will arise to disappoint those sanguine expectations. If mercury is at all admissible for this form of venereal disease, it is, as I before observed, where the malady is obviously on the decline, and that the eruption has assumed the appearance of scaly tubercles or blotches. This observation equally applies to the pustular form of the venereal disease. It is not my wish to enter further here into the consideration of the different forms of venereal diseases, as the object of this paper is merely to point out, from my own experience, where mercury may be found useful and where injurious.

“6th. For the true Hunterian chancre, with hardened edge and base, and for the scaly eruption, either lepra or psoriasis, which attends it, as well as the deep excavated ulcer of the tonsils, nodes, and other symptoms belonging to this form of disease, mercury, in full doses, may be esteemed a certain and expeditious remedy; and the reason of the necessity of exhibiting mercury seems to be, that both in its primary and secondary symptoms there is but little or no accompanying inflammation of fever as in the other forms of these maladies. Hence, perhaps, the utility of raising artificially a fever in the system, to overcome the morbid effects of the poison. I have no doubt, however, but that even this form of venereal may yield to other

remedies, or even to the unassisted powers of the constitution. But from the few instances I have seen treated on the antiphlogistic plan, without mercury, so long a period elapsed before recovery took place, that it is not likely this remedy will ever be generally omitted in its treatment. It is true, that some years since, on visiting the great hospital at Montpellier, the late much lamented M. Delpech pointed out to me some cases of chancre successfully treated by destroying the callous base of the ulcer with caustic, a practice which that celebrated surgeon told me he had for some years adopted with the most satisfactory results."

Consult Hunter on the Venereal Disease, by Adams; Benjamin Bell on Lues Venerea; Adams on Morbid Poisons; Sawrey's Inquiries into some of the Effects of the Venereal Poison, 1802; Swediaur on Syphilis, &c., translated by Hewson; Abernethy's Surgical Works, vol. i.; Blair's Essay on the Venereal Disease, and the Effects of Nitrous Acid and other analogous Remedies, lately proposed as substitutes for Mercury, 1808; Pearson on the Effects of various Articles of the Materia Medica in the Cure of Lues Venerea, 2d edit., 1807; Carmichael's Essays on the Venereal Diseases which have been confounded with Syphilis, 1814; Carmichael's Observations on the Symptoms and Specific Distinctions of Venereal Diseases, 1818; Rose's Observations on the Treatment of Syphilis, with an account of several Cases in which a Cure was effected without Mercury, in *Medico-Chirurgical Transactions*, vol. viii.; Hennen's Observations on Syphilis, in his *Principles of Surgery*, p. 488; Evans's Remarks on Ulcerations of the Genital Organs, 1819; Bacot on Syphilis, 1821; Sir Charles Bell's Report on the use of Nitro-Muriatic Acid Bath in certain obscure Cases of Syphilis, in his *Surgical Observations*, vol. i. p. 338; H. Scott on the Internal and External Use of the Nitro-Muriatic Acid, in *Med. Chir. Transact.* vol. viii.; R. Carmichael, an Essay on Venereal Diseases, and the Uses and Abuses of Mercury, Lond. 1825; G. J. Guthrie on the Treatment of Venereal Diseases without Mercury, in *Med. Chir. Transact.*, vol. viii.; B. Travers on the Pathology of the Venereal Disease, Lond. 1830; W. Wallace on the Venereal Disease, 1833; A. Colles on Venereal Diseases, Lond. 1837; Ph. Ricord, *Traité Pratique des Maladies Venerien*, Paris, 1838; Summary of Mr. Carmichael's Views of the Venereal Cases in which Mercury is admissible or not admissible, in *Dub. Jour. of Med. Science*, 1838; Clinical Lectures on Venereal Diseases by Richard Carmichael, Dublin, 1842.

CHAPTER VII.

FRACTURES.

THE bones are all subject to fracture: though some yield more readily than others. In general, the long or cylindrical bones more frequently suffer than the short or flat ones, inasmuch as they serve a greater number of purposes, and are commonly under the influence and direction of large and powerful muscles.

A bone may be broken either by a direct blow, or by force applied to both of its extremities at the same moment. In the former case, the fracture occurs at the spot upon which the injury is immediately received; in the latter, the bone commonly yields about its centre or at some intermediate portion. The muscles are generally more or less concerned in the production of fractures, and in many instances, without any other co-operating power, break the largest and strongest bones. At other times the bones, from old age and diseases, are rendered brittle, and are easily fractured, either from external violence or muscular action.

A patient of mine, a Mr. Green, residing near Trenton, in Jersey, has a son, now nineteen years of age, who from infancy, up to the present period, has been subject to fractures from the slightest causes, owing to an extraordinary brittleness of the bones. The bones of the arm, forearm, thigh, and leg, have all been broken repeatedly, even from so trivial an accident as catching the foot in a fold of carpet whilst walking across the room. The clavicles have suffered more than any other bone—having been fractured eight times. What is remarkable, the boy has always enjoyed excellent health, and the bones have united without much difficulty or much deformity. The above was published in 1824; since then this patient died, in the twenty-third year of his age, from partial dislocation of the first and second vertebræ of the neck, after a painful illness of fourteen weeks. Altogether he had experienced *twenty-four* fractures.

An interesting case of fragilitas ossium was reported to me in December, 1828, by Dr. F. Mettauer of Virginia. The following are the particulars. "Alexander Mc. * * * *, a native of Scotland, about seventy years of age, rather below the common stature, of ruddy complexion, neither lean nor corpulent, of a sprightly, though irritable and pugnacious disposition, had always enjoyed excellent health, an inhabitant of Petersburg, Virginia, for twenty-five years, was so remarkable for his great liability to fracture his bones, that if he were seen a quarter of a mile from his dwelling, it was very common to hear some one say, "There goes old Ellick; I'll engage he will break some of his bones before he returns." "He assured me," says Dr. M., "that it always appeared to him from early infancy, that his bones were more easily broken than any other person's, and that he believed he could break the bones of the forearm at any time, by pressing them between his thumb and fore-finger—that he had several times fractured the ulna, radius, os humeri, clavicles, in giving blows. None of his bones," continues Dr. M., "seem exempt from this extraordinary brittleness, for since my residence in Petersburg, I know of ten or twelve fractures of different bones. I think it probable more may have occurred during the same period; for latterly, the accident having become very frequent, his domestics managed his case, having, from their experience, become expert bone-setters. The tibia, fibula, os femoris, have been broken several times from a sudden twist of the body, and from efforts to save himself from falls. His thigh-bones have been broken when attempting to get on horseback. His ribs have also been frequently fractured from slight causes. His speedy recovery astonished all who were acquainted with his case; for seldom, in any instance, has he been confined more than three weeks."

Dr. Elkinton, of this city, has also furnished me with a case of fracture of the bones, produced, there is reason to believe, by muscular action conjoined with extraordinary brittleness of the osseous texture. "In January, 1827," says he, "while practising at Haddonfield, New Jersey, six miles from Philadelphia, I was called to see Mr. Benjamin Barrett, a respectable man, about forty years of age. He was seized with a fit, but when I arrived, had become tranquil; some medicine was directed for him, and as he was subject to epilepsy, I left him in charge of careful attendants. On my third visit, three days subsequently

to his first attack, being alarmed at the contracted state of the pupil and other indications of disordered brain, a blister was ordered to the back of his neck, and upon removing his clothing a fracture of *both* arms was discovered above the elbow. Notwithstanding my investigations were made with the strictest scrutiny, I could not ascertain that the patient had received any injury either by falling out of bed or in any other manner. The only explanation I was enabled to assign for this strange occurrence, was obtained from the report of his friends. They stated, that during the night of his attack, while struggling in a fit, a very distinct noise or crack was heard, which, to use their own expressions, seemed as if he were breaking his bones. I have not the least doubt but that both fractures occurred at the time the noise was heard, from the force of muscular contraction operating on a system possessing some peculiarity in the organization of the osseous structure. This opinion was strengthened on mentioning the case to my senior colleague, Dr. Hendry, who had frequently attended the patient, and remarked at the time, *it was very common for Mr. Barrett to have his bones broken.* In a short time the bones were perfectly reunited."

Dr. Goddard, our accomplished demonstrator of anatomy, has, likewise, detailed to me a case of fragilitas ossium, equal in interest to either of the foregoing—the particulars of which I here state.

"September 27, 1832, Martin Stevenson, between three and four years old, fell from a step six inches in height, and fractured his thigh. When called to him, his mother informed me that he had twice before fractured this thigh from very trifling causes. She also stated, that she herself had suffered from fracture once in the right thigh, and five times in the left. She first broke her left thigh, and found, upon recovery, that the right, from sustaining the principal part of her weight, was very painful, that at last it gave way on making a slight exertion, and shortened as much as the other had, during the cure, but has not been broken since. She also informed me that her brother, at thirteen, had suffered *two* fractures of one thigh and *nine* of the other, as well as *two* of the arm; besides which, one of his hip joints had been *dislocated*; from all of which he has perfectly recovered, with the exception of the deformity. Martin's thigh was firmly united in five weeks, and he was running about as usual. These people are of very short stature, and have small bones.

“January 16, 1833, Martin, whilst eating his supper, fell from his chair, and fractured both bones of the forearm, for which he is at this moment under treatment. He is now four years and one month old, and has had four fractures.

“Since the communication of the above case of ‘*fragilitas ossium*,’ in the person of Martin Stevenson, he has had four bones fractured. On the twenty-ninth of May, 1833, a little girl took hold of the forearm (which had previously been broken,) rather rudely, and fractured the ulna; it was well in about three weeks. This was on the left side. On the ninth of September following, Martin tripped and fell down two stairs (about twelve inches high altogether,) and fractured the humerus radius and tibia of the right side. They were all united and the apparatus taken off by the fifth of October, not quite four weeks. He is now quite well, and as lively and playful as any boy of his age.”

Along with Dr. Caspar Morris, of this city, I attended a lady, eight years ago, whose case was, in many respects, similar to those just detailed. During the winter of 1836, Dr. Morris also attended Martin Stevenson three times with fractured thighs. Still more recently the same patient has received three similar injuries, and altogether, as Dr. Goddard informs me—May, 1841,—has had his bones broken *fourteen* times.

Fractures are most frequent during very cold weather. On this account many have supposed that cold affects the texture of bones, and predisposes them to give way. But the true explanation is, that persons in walking while the ground is hard and slippery, make unusual efforts to sustain themselves, by which the muscles are rendered tense and thrown into full action, and if they happen to fall, the two powers combined—the resistance of the frozen earth and inordinate muscular exertion—very readily produce fractures, and sometimes more important injuries.

Fractures have been divided into different *species*—according to the extent of the injury, and the particular direction in which the fibres of the bone happen to yield. Thus, we have a simple, compound, and complicated fracture; and again, a transverse, oblique, comminutive, and longitudinal fracture. By the term *simple* fracture is understood a mere separation of bony fibres, unattended by severe contusion or external wound. From this, a *compound* fracture differs, in being conjoined with an external wound, or with a protruded bone. A *complicated* fracture im-

plies that the bone is broken at more than one place, or is combined with luxation, with laceration of one or more large vessels, or rupture of ligaments, tendons, &c., or with a gun-shot wound. A fracture is said to be *transverse*, when its direction is perpendicular to the axis of the bone. It is denominated *oblique*, when it deviates from the perpendicular direction. In *comminutive* fracture, the bone is broken into several pieces or crushed into fragments. A *longitudinal* fracture runs parallel with the axis of the bone.

The *signs* of fracture are not always very decisive. In general, however, *crepitation*, or that particular noise or sensation produced by rubbing together the fragments of a broken bone, is more to be relied on than any other, and is an almost certain indication of fracture. Added to this, there is usually more or less deformity, pain, swelling, inability to use or move the limb. But these symptoms may attend luxation and other injuries, and are therefore not unequivocal proofs of fracture. Besides, it is possible for a patient actually to labour under fracture of one or more bones, and yet, from interlocking of the fragments, or from a sound bone serving as a splint and supporting the broken one, no distortion will be perceived. Many instances are related of patients walking about, under these circumstances, for some time after the accident.*

The *prognosis* in fracture will depend very much upon the extent of the injury, the constitution and age of the patient, the direction of the fracture, and the particular bone broken. Complicated and compound fractures will prove more dangerous than any others, especially if they occur in old people and in bad habits of body. An oblique fracture is commonly more difficult to manage than a transverse one, owing to the fragments of bone overlapping—from muscular contraction. It is possible, however, for the ends of a bone, when broken transversely, to pass each other; though this seldom happens unless the cause of the fracture act with uncommon violence, or some subsequent force be applied. In either case, the parts will sustain more injury and the danger will be greater than if the bone were broken obliquely, and by a moderate force.

The *direction* of displacement, or derangement of the fragments of a broken bone, must always depend either upon the force by

* See Dorsey's Elements, vol. i. p. 113, and Allan's Surgery, vol. ii. p. 60.

which the accident was produced, upon muscular action, or upon the weight of the body, or that of the injured part. Sometimes the derangement is *angular*, sometimes *longitudinal*, or parallel with the axis of the bones, in other instances in the direction of its *diameter*, and again—in that of its *circumference*.

Dupuytren and Dr. John Rhea Barton have each furnished accounts of *bent* bones. There are no such injuries, however, in my opinion—such cases being, in reality, *partial* fractures, from which deformities result; upon the same principle that a piece of tough wood, like oak or hickory, if broken half through, may be inclined to one side and shortened, although still held together by interlocking of fibres. Many specimens in my cabinet, and in the Wistar Museum, attest the accuracy of this assertion.

TREATMENT OF FRACTURES.

The general indications in the treatment of fractures are, to prevent or subdue inflammation, and to coaptate and retain the fragments in contact by appropriate mechanical means, until they are restored to their pristine condition through the medium of callus. The former are best accomplished by the antiphlogistic system and by position—the latter by extension, counter-extension, splints and bandages.

By *extension* is understood a force applied to the lower fragment, sufficient to remove it from the superior fragment; by *counter-extension*, a power calculated to resist the operations of extension. These means are not necessary, however, or applicable to all fractures. Frequently coaptation, or a proper adjustment of the fragments by the fingers, will answer every purpose. In other instances, position, splints and bandages are only required.

The *bandages*, usually employed in fractures, are made of coarse muslin or hummum, an article, from its flexibility and roughness, peculiarly adapted to fit accurately and adhere closely to any part of the body. The muslin should always be washed before it is used, and the selvage or rough edge torn off. Bandages should, if possible, be free from seams, which by pressure often excite irritation or produce welts in the skin, that sometimes annoy the patient more than the fracture itself. The single-headed roller, and the bandage of Scultetus have super-

seded most others, and are adapted to a great variety of purposes. The roller is chiefly employed in fractures of the upper extremities, the bones of the chest, &c. In general, it accommodates itself best to the shape of the part when somewhat narrow.

The bandage of *Scultetus* is chiefly useful in fractures of the thigh and leg. It consists of numerous strips or pieces of the same breadth, and of equal or unequal length, according to the shape of the part it is intended to surround. Each piece overlaps the other about two-thirds. The great value of this bandage arises from the facility with which it can be removed and re-applied, without disturbing or moving the limb. It will be more particularly described hereafter.

To apply a roller or any other bandage with neatness and effect, a great deal of practice will be required. A student should be very careful, however, not to fall into the error I have known some young surgeons commit, from aiming at feats of dexterity and despatch—by drawing the roller with immoderate tightness in order to make it lay smooth and hide rough edges—a practice well enough on the dead subject, but followed by pain, obstruction of the circulation, and other ill consequences when applied to the living body. Again—the more a surgeon accustoms himself to roll up his bandages with his own hands, the more dexterity will he acquire in applying them.

Splints, are made of different materials—of pasteboard, binders' boards, wood, iron, and tin. Binders' boards, however, answer a better purpose than the others in most fractures, inasmuch as they adapt themselves, when moist, to the shape of the injured part, and, when dry, have sufficient strength and stiffness to retain the position given to them. Common pasteboard is too thin and flexible to give any support to a fractured bone, and tin, from its hard and unyielding nature, cannot be employed without creating pain and uneasiness. Woodensplints are chiefly adapted to fractures of the long and large cylindrical bones—as those of the thigh and leg. In general, splints should at least equal in length the fractured bone; sometimes they are required longer. Within the last few years a very useful splint has been contrived by an ingenious physician of the Eastern States. It is composed of *felt*, (or the material of which hats are made,) and apparently soaked in shellac varnish; when warmed it becomes extremely soft and flexible, and adapts itself readily

to the slightest inequality of a limb, and afterwards hardens and acquires all the firmness of wood or of binders' boards.

That splints and bandages, however well contrived, have proved more or less defective, every experienced surgeon must admit. Attempts have accordingly been made in every age, to obviate the chief objections to which they are liable, by substituting materials of such texture and tenacity as are calculated, by surrounding a limb or part, to keep it firmly and unalterably fixed in the position required. But all of these were so rude and imperfect, and attended with so many inconveniences to the patient as to cause them to be laid aside after a very few trials. It would be useless, therefore, to detail the methods of the Arabians, consisting chiefly of wooden rods glued together and supported by leather; the consolidating mixtures of the Greeks, composed mostly of mastic and other resinous materials; moistened pasteboard, slacked lime, white of eggs, Armenian bole, combined with pitch or resin, of the Italians; the wheaten flour and white of eggs, of the old English surgeons; as all have been successively banished from practice. Even plaster of Paris, so long employed by the Turks—which I myself, without the knowledge of its having been previously used, tried experiments with in 1819—which subsequently was introduced into European practice by Dieffenbach, and ascribed to him as an invention, has shared the fate of its predecessors, and is now rarely resorted to with such views. Out of such trials, however, occasionally made from age to age, has grown the fashionable innovation now known under the title of *Immoveable Apparatus*.

This may be said to have been brought into use by *Suetin* of Brussels, who, in 1834, tried numerous experiments upon soldiers wounded at the siege of Antwerp, first with Larrey's compresses, saturated with white of eggs, spirits of camphor, and acetate of lead—which had been used by him at Moscow—and, finally, with *starch*, an article, from its peculiar lightness and strength, when incorporated with bandages and hardened, seemed better calculated for his purposes than most other materials. Four or five rollers are generally necessary, and as many ounces of boiled starch. Compresses moistened with spirits of camphor are next applied to the limb, and over these a dry roller, which commences below, and extends to the

requisite distance above. A second roller is then put on, and extends from above downwards. Splints of binders' boards, well soaked, are next moulded to the limb, and covered with the starch. Other rollers, soaked in the same material, being applied, and the hollows or inequalities filled up by lint or charpie, the fractured limb is put in a proper position, well supported, and kept at rest until the dressings are well consolidated into a firm immoveable mass. Several years have now elapsed since the introduction of this practice, and a great many trials have been made with the apparatus, and with more or less success both in Europe and this country, under different modifications. In many respects, however, the starch has been found objectionable, particularly on account of its taking a long time to dry. Favourably impressed with the method, Velpeau endeavoured to procure some other material, free from the faults and inconveniences of starch, and after numerous trials, selected the article "*Dextrine*," as better calculated to answer the purpose than any other subjected to the test of experiment. He applied it to fractured limbs of every description, in the way mentioned, in hospital as well as private practice, and has given his unqualified sanction to the method, as we learn from his writings, and from a valuable inaugural essay by Dr. Van Buren, one of his hospital pupils, who says, "The bandages in less than six hours become so firm and hard, as to sustain the limb more perfectly than the most complicated machines, and the patient may take exercise constantly, making use of crutches, and supporting the part by a stirrup of bandage passed around the neck, without the least danger of deranging the apparatus. In fact, patients at La Charité with limbs fractured, are frequently seen promenading the garden in a day or two from their entrance, with perfect ease. When the period has elapsed, which is necessary to the consolidation of the fracture, the apparatus is removed with the greatest facility, after soaking the part for a few minutes in water. In the use of dextrine in this manner, M. Velpeau has been gratified with the most perfect success. During a period of eight months of constant attention in his wards, in which time upwards of fifty cases of fractures came under his care, I saw there no other apparatus but that of dextrine, and the bandage of Scultetus, for immediate use in compound fractures. Part of the time, I was actively engaged in his service, and had frequent

opportunities of applying the apparatus under his inspection, and of closely watching its action during the whole progress of cure.”*

Hitherto the trials with dextrine in the United States have excited very little attention; but it is to be hoped, after the favourable reports thus made of the practice, that it will be subjected to the tests it seems to merit, particularly from hospital surgeons. I regret to say that so far, my own experience in it is very limited, but I can bear testimony to Dr. Van Buren's statements, and to his own industry—having witnessed, four years ago, at La Charité some of the experiments he refers to.

The time necessary for reunion and consolidation of fractures, must vary according to the age and constitution of the patient, the situation and extent of the fracture, and some other circumstances. Young and healthy subjects recover in a shorter time than old and infirm, and the process of reunion is sooner completed in a small than a large bone. From two to eight weeks usually elapse before consolidation is established, but a much longer time will be required for perfect restoration of the injured part.

SECTION I.

FRACTURE OF THE NOSE AND UPPER JAW.

THE bones of the nose may be fractured and driven in at a blow; or they may be crushed by the passage of a wheel, or by a gun-shot. In either case there is commonly more or less concussion of the brain. Sometimes the impulse is communicated to the septum, and thence transmitted to the delicate cribriform plate of the ethmoid bone, which is broken up and forced upon the brain—producing violent symptoms, and even death. Such accidents, however, are rare; and the usual symptoms are severe pain, copious flow of blood, and difficulty of breathing.

* On the Immoveable Apparatus and its therapeutic application to various surgical diseases, by William Holme Van Buren, *Amer. Jour. Med. Sciences*, No. li. May, 1840, p. 49.

If the case has been neglected, permanent deformity may ensue—from lateral distortion or depression of the bones. From the same cause, also, incurable epiphora or fistula lachrymalis may result.

A bullet sometimes passes through the base of the nose across the face, leaving a round opening without destroying the nasal outline or arch. The bones and septum, however, are sure to crumble away afterwards, and leave great deformity. A remarkable instance of the kind I met with at the battle of North Point, in the case of Mr. V., a young gentleman previously distinguished for his personal comeliness, and not less, subsequently, for the hideous deformity of his features.

The cheek and upper jaw bones are seldom fractured, except by a gun-shot wound, or from the application of very great violence. In two instances I have known a considerable portion of the alveolar process broken off along with the teeth, from immoderate force employed by an ignorant dentist in an attempt to extract a large stump. The antrum maxillare in one of the patients was completely exposed. Le Dran has furnished an interesting case of fracture of the upper jaw, in which four of the molar teeth, along with their alveolar processes, were broken up and forced under the roof of the mouth. I have known, also, a fissure to extend through the nasal process of the upper jaw, and prove fatal from inflammation communicated to the brain.

TREATMENT OF FRACTURE OF THE NOSE, ETC.

The nasal bones when fractured should be elevated and replaced as soon as possible, otherwise the pain and tumefaction become so great, that it is not easy to discover the direction of displacement; and before these symptoms can be reduced, the bones may become fixed in their unnatural situation, and create great deformity and fistula lachrymalis. A case of the kind has been related by Boyer.

To restore the fragments to their proper places, the end of a female catheter, or a strong probe, or any similar instrument, may be introduced into the nostrils and used as a lever, while the fingers are employed externally in modelling the parts to their natural shape. After the fragments have been elevated, they generally preserve their situation without the assistance of

quills, lint, and other contrivances advised to be stuffed into the nostrils, which cannot prove serviceable, but, on the contrary, must add to the irritation. The remainder of the treatment consists in removing the inflammation, after which the bones soon become firm, and a cure follows.

Fractures of the upper jaw and bones of the cheek, seldom require any other remedies than those calculated to subdue moderate inflammation. If the symptoms, however, are urgent, the most vigorous antiphlogistic measures should be resorted to immediately. When large portions of the alveolar processes to which the teeth adhere, have been broken, and remain only attached to the soft parts, it has been proposed to replace the fragments and secure them, by fastening the insulated teeth with silk or wire to those in the sound part of the bone. This was successfully practised in Le Dran's case, but I much question the necessity of the measure.

SECTION II.

FRACTURE OF THE LOWER JAW.

THE lower jaw, notwithstanding its mobility, is frequently fractured. The fracture may take place at or near the symphysis, between the symphysis and angle, at the angle itself, or in the condyloid or coronoid process. Sometimes it is fractured in two places—on each side of the chin; in which case the chin is insulated, and there are three fragments and two fractures. The *coronoid* process, being covered and protected by very strong and fleshy muscles, is seldom broken; nor is the *condyloid* much exposed to such injuries. A separation of the jaw at the symphysis is usually met with amongst young subjects; though I have seen one instance of it in a man beyond forty years of age.

Fracture commonly takes place on one side only of the jaw, and the most frequent seat of it is intermediate to the symphysis and angle. The *direction* of the fracture may be oblique or

transverse; except in fractures of the alveolar ridge, in which case the direction will be longitudinal.

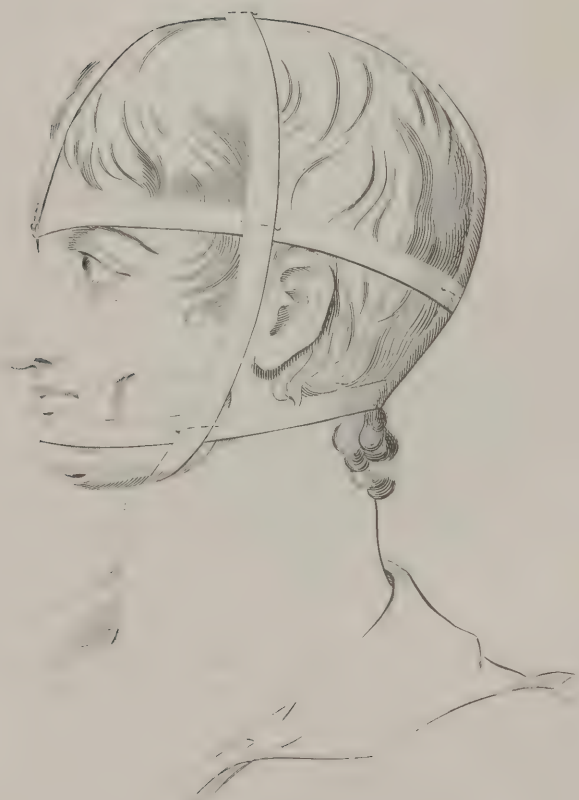
The *signs* of a fractured lower jaw are generally very distinct and evident. Crepitation can almost always be observed, and upon looking into the mouth the teeth will be found irregular and oftentimes loosened. When the chin has been insulated by a fracture on each side of it, it will be drawn downward, considerably below the level of the adjoining fragments, by the action of the muscles of the throat inserted into its point.

Fracture of the neck of the condyloid process may generally be distinguished by the grating noise and pain produced in the neighbourhood of the ear when the jaw is moved, and by the circumstance of the condyle being dragged forward by the action of the pterygoideus externus muscle.

Compound and complicated fractures of the lower jaw, now and then met with, are not only extremely annoying and painful to the patient,—from loose splinters of bone being constantly detached for months together, from copious discharges of fetid matter into the mouth, or through fistulous orifices about the face and neck,—but will be found by the surgeon very difficult to manage. A case of the kind was under my care three years ago in the clinical wards of the Philadelphia Hospital, which occurred at Norristown some weeks before. From excess of inflammation, profuse discharges of matter, carious and exfoliating bones, months elapsed without much amendment.

TREATMENT OF FRACTURE OF THE LOWER JAW.

The surgeon having carefully examined the injured parts, and replaced such teeth as are shaken or loose, runs his finger along the margin of the jaw, models the parts into proper shape, and closes the mouth firmly, making the lower teeth rest fairly against the upper. Then a cotton or linen compress of moderate thickness, reaching from the angle of the jaw nearly to the chin, is placed beneath and held by an assistant, while the surgeon takes a roller, four or five yards long, an inch and a half wide, and passes it by several successive turns under the jaw up along the sides of the face and over the head; now changing the course of the bandage, he causes it to pass off at a right angle from the perpendicular cast, and to encircle the temple, occiput and fore-



head horizontally by several turns: finally, to render the whole more secure, several additional horizontal turns are made around the back of the neck, under the ear, along the base of the jaw, and over the point of the chin. To prevent the roller from slipping or changing its position, a short piece may be secured by a pin to the horizontal turn that encircles the forehead, and passed backwards along the centre of the head as far as the neck, where it must be tacked to the lower horizontal turn—taking care to fix one or more pins at every point at which the roller has crossed. This simple method of securing a fractured jaw I have practised very successfully for several years. The operation is more easily performed than described, but may be well understood by examination of the sketch in Plate IX.

Where the jaw is broken on both sides, and the chin, from want of support, or the action of muscles, falls downwards and backwards, it may possibly become necessary to resort to machinery for sustaining it. Plates with screws attached to them have been invented by Graefe of Berlin, and Lonsdale of England, so contrived as to keep the teeth on a level, and thereby the fragments of bone corresponding with them; or a plaster of Paris mould may be adapted to the jaw after the parts have been replaced, which, when it sets or becomes firm will prevent displacement; or felt splints, or those of moistened pasteboard, or compresses soaked in starch or dextrine, may be used for the same purpose.

Whatever plan may be pursued in bandaging the jaw, there can be no necessity for the interposition of pieces of cork between the teeth, or for pulling a tooth to nourish the patient, or for the introduction of the gum elastic catheter through the nostrils for the same purpose, as there is always sufficient space between the teeth to enable the patient to imbibe broth or any other thin fluid placed between his lips. During the cure the jaw should be kept as still as possible, otherwise deformity will be apt to ensue.

In general, simple fractures of the lower jaw consolidate very readily, owing to the abundant vascular supply; and the reunion of the fragments is so accurate and perfect, as to render it difficult to find a specimen in any cabinet strongly marked.

SECTION III.

FRACTURE OF THE VERTEBRÆ.

THE bones composing the spinal column are seldom fractured. Such accidents, however, when they do occur, are always the result of great violence, and are generally followed, immediately or remotely, by most severe symptoms or by death. In some cases there is violent concussion of the spine without fracture, which gives rise to paralysis of the lower extremities; but this subsides in a little time and the patient recovers. The effects of fracture are more permanent, and although at first not always severe, may terminate most unfavourably. Sometimes an effusion of blood is found, upon dissection, either on the outer or inner surface of the spinal sheath; at other times the spinal marrow is compressed or wounded by a projecting fragment of bone. From either cause high excitement and paralysis ensue, and at a later period inflammation and suppuration within the membranes of the spinal marrow. So copious, indeed, in some instances is the matter, that it travels along the sheath, and is lodged at a great distance from the injured part. It is this thickening of the sheath from inflammation and suppuration within its cavity, that is the cause of death in nine cases out of ten. This explanation was first given by Sir Charles Bell, the only writer that appears to have taken a correct view of the pathology and treatment of injuries of the spine.

Fractures of the vertebræ produce different effects, according to the particular situation of the bone injured. If the fracture take place above the *fourth cervical* vertebra, death follows almost instantaneously—owing to the injury sustained by the phrenic nerve. When the fracture occurs below the fourth vertebra, there is usually paralysis of the arms, and difficult respiration, and death follows in four or five days.

Fractures of the dorsal vertebræ are succeeded by paralysis of the lower extremities and by great torpor of the intestines. In some cases, the abdomen becomes enormously distended from quantities of air, contained within the bowels. The patient seldom lives beyond the third or fourth week.

When the lumbar vertebræ are fractured, the bladder and rectum lose their powers of retention, and the urine and fæces pass

away involuntarily; the lower extremities are completely paralyzed and perfectly insensible to the most powerful stimulus, while the heat and circulation in the limbs are but slightly, if at all diminished. Death follows at a later period than after similar injuries of the cervical and dorsal vertebræ; though the patient seldom survives beyond five or six weeks.

Priapism, a symptom first noticed by Sir Charles Bell as an attendant upon injuries of the spine, has been represented subsequently by numerous writers as by no means uncommon. According to Sir Benjamin Brodie,* it is sometimes caused by the mechanical irritation of the catheter, without consciousness of the patient,—a fact, for which, he says, he is indebted to Professor Macartney, of Dublin. The symptom, however, is not peculiar to injuries of the spine, but may arise from many other causes, local as well as constitutional.

Fracture of the *spinous processes* of the vertebræ is seldom followed by any serious consequences, unless accompanied by violent concussion or some other injury.

TREATMENT OF FRACTURE OF THE VERTEBRÆ.

From what has been said it will appear that little benefit may be expected in most cases from any treatment that can be adopted. It was long ago proposed to cut down upon the injured part, and remove by the trephine the displaced portion of bone compressing the spinal marrow. Such an operation was actually performed by Mr. Henry Cline, and afterwards by Mr. Tyrrell, but without success. Dr. A. G. Smith, of New York, repeated the experiment some years since, in a case of paralysis, but not with permanent benefit.† I concur, however, entirely with Sir Charles Bell, in thinking “that the palsy is a consequence of the swelling of the membranes, and proceeds from inflammation; and if you cut down upon the bone and saw it out, and expose these membranes, you will not only increase the swelling and thickening of the involving membranes, but you will most probably raise such direct inflammation and mischief as to cut off the patient suddenly.”‡ Should the patient survive the immediate effects of the injury, the urine must be drawn off frequently

* See Med. Chirurg. Transact. vol. xx. p. 140.

† See North Amer. Med. and Surg. Journ.

‡ Surgical Observations, vol. i. p. 160.

by the catheter, and such measures taken as are calculated to obviate inflammation within the sheath of the spinal marrow. Afterwards stimulating frictions, issues, &c., may perhaps prove serviceable.

It is much to be regretted that the late Sir Astley Cooper should have added the weight of his high authority in sanction of the idea that a surgeon is justified in *trephining* the spine, upon the ground—certainly untenable—of fracture of the vertebræ being “similar to depressed fracture of the cranium.” Independently of other considerations, the circumstance of the *bodies* of the vertebræ being the parts generally fractured,—in which case the surgeon would be obliged to cut through the *spinal marrow* to reach the fracture,—would preclude the possibility of the operation; or, at least, of any benefit resulting from it.*

It is consolatory to observe, however, that neither Brodie, nor Liston, nor Gulliver, nor most other surgeons that have turned their attention to the subject, have been influenced by the authority of Sir Astley; but on the contrary unhesitatingly condemn all such proceedings. Attempts have also been made in fractures of the spinous processes, with slight displacement of the adjoining parts, to restore the deformity by *extension* of the spinal column. Cases of the kind have been reported by Barlow, of Writtle, Hardwicke, of Epsom, and Sir Benjamin Brodie—but with very little success. Before resorting to such a measure, the surgeon should call to mind Boyer’s case of a child who died from the operation.

SECTION IV.

FRACTURE OF THE RIBS.

THE ribs may be fractured from a direct blow or from force applied to their extremities. In the former case an *internal* angular derangement will follow,—in the latter, the angle will be

* See Sir Charles Bell’s Lectures on Injuries of the Spine, &c., 4to., 1824.

salient *externally*. Owing to the extremities of the ribs being strongly connected to the sternum and spine, the fractured portions cannot overlap or pass each other; but derangement may occur in almost any other direction, though the angular is most common. Boyer has declared that derangement cannot happen in the direction of the diameter of a rib: this, however, is a mistake, as specimens in my cabinet sufficiently prove.

Fracture of a rib may be transverse, oblique, compound, complicated, and comminuted. The transverse are most frequent, although the oblique are by no means uncommon. The complicated are most dangerous, and may be combined with rupture of the intercostal arteries, emphysema, and injuries of the lungs. It is not always easy to discover a fracture of the rib. Sometimes there is a distinct crepitation, and then the nature of the accident is rendered very plain. The presence of emphysema also affords almost certain evidence of the existence of fracture. Generally the patient complains of difficult respiration, especially when lying in the recumbent posture, and of sharp, pricking pain in the seat of the injury, which is increased upon making a full inspiration, or upon coughing.

Sir Charles Bell, in his "Surgical Observations," has detailed the histories of several interesting cases of fractured ribs, followed by emphysema, caries, and suppuration in the chest and pericardium, most of which proved fatal a few weeks or months after the injury. Several cases, also, have been furnished by Dr. Olivier of Angers, of sudden death from extreme pressure on the ribs in a crowd.

TREATMENT OF FRACTURE OF THE RIBS.

Little benefit commonly results from an attempt to coaptate the fractured ends of a rib. When the force, however, causing the injury has been very violent, and the fragments have been driven internally or towards the pleura and lungs, well-directed pressure upon each extremity of the rib may cause them to resume their former position. On the contrary, pressure applied to the fracture itself will become necessary when there is angular derangement externally. But the chief indication in the treatment is to oblige the patient to breathe by the diaphragm and abdominal muscles, in order to keep the intercostal muscles

at rest while the process of reunion is taking place. This is accomplished by a broad roller, passed circularly about the chest, and made to envelop the greater part of it, placing a *single* compress, if the derangement be external, over the fractured part and under the roller, and *two* if the derangement be internal—one at each end of the rib. These co-operate with the bandage in forcing the fragments into their proper places. Conjoined with this treatment, general blood-letting and elevation of the patient's shoulders by pillows placed behind his back, will prove extremely useful. Should hemorrhage take place from a wound of the intercostal artery, or emphysema follow from a wounded lung, the treatment formerly pointed out, under the head of *Wounds of the Chest*, must be pursued. Cases have been reported of pleuritis, attended with violent symptoms, following speedily fractured ribs. The surgeon, therefore, cannot be too much on his guard, and should bleed copiously the moment such indications present. Opium, in all injuries of the chest, will, also, prove more or less useful.

SECTION V.

FRACTURE OF THE STERNUM.

FRACTURE of the sternum is usually the result of considerable violence; hence the mischief that ensues is not always confined to the bone, but extends to the sensible membranes and organs within the chest: these inflame and suppurate, and not unfrequently considerable collections of pus take place in the anterior mediastinum—either from the immediate injury, or from subsequent caries of the bone. I have met with several cases of the kind, and had occasion, several years ago, in the Philadelphia Hospital, twice to trephine the sternum in two different patients, on account of caries and lodgement of matter.

Sanson has recorded an instance of laceration of the right ventricle of the heart, from a fragment of the sternum; and I saw,

in 1839, a heart in the museum of the London University, which had sustained a similar injury. Wounds of the lungs have been known to be produced in the same way. Of all the causes of fracture of the sternum, gun-shot wounds are the most formidable. From muscular action alone, according to David, the accident may result.

Fracture of the sternum may be known by the incessant grating of the fragments upon each other during respiration, which is so remarkable in some instances as to be heard a considerable distance. Besides this sign, which is very decisive, there are others—palpitation of the heart, difficult respiration, severe pain and troublesome cough. The bone will sometimes be found broken in three or four pieces. The direction of the fracture is commonly transverse. The ensiform cartilage in old subjects is sometimes broken.

TREATMENT OF FRACTURE OF THE STERNUM.

The chief indications in the treatment of this injury, are to prevent and subdue inflammation, and to appease the incessant cough and difficult respiration that usually attend. The former are best accomplished by repeated blood-letting,—the latter by opiates, and by supporting the patient in bed in a sitting posture.

Quiescence of the chest, also, is essential, and readily effected by a roller drawn with sufficient tightness to impede the action of the intercostal muscles.

Should matter form beneath the sternum, or collect within the mediastinum, an opening may be made cautiously with the crown of a trephine—so small as not to exceed half an inch in diameter. The same instrument, aided by Hey's saw, bone-nippers and forceps, will also answer for removing carious portions of bone—at the same time bearing in mind, not to be too officious in picking away or scraping the bone, which by such means may be rendered diseased or made to exfoliate, when, if it had been left to nature, it might have recovered. Experience, however, has taught me, latterly, that the operation of the trephine, just referred to, is seldom productive of lasting benefit. In patients upon whom I have operated, since the cases mentioned above, I have found the caries to return, and eventually death has taken place,—apparently from phthisis pulmonalis.

SECTION VI.

FRACTURE OF THE CLAVICLE.

THE clavicle, from its exposed situation and delicate form, is peculiarly subject to fracture. It may be broken by a force directly applied to it, or by a *counter-stroke*. In the latter case, the effect is generally produced by a fall upon the point of the shoulder, or on the hand, which is instinctively put forward to save the body. From either cause fracture is most common about the middle or vaulted part of the bone, usually oblique or transverse, and seldom compound or complicated.

Extensive injuries of the latter kind, however, I have known a few examples of, chiefly from the recoil of duck guns, heavily charged and fired while the patient lies in the recumbent position, so that the heel of the piece is made to bear directly against the bone, and from heavy weights falling upon the shoulder. A remarkable instance of the sort was presented to me in September, 1838. A young man, named Riechard, of Hagerstown, Maryland, was standing beneath a large apple tree, while his companion, in the tree above, was sawing off a limb, which snapping off unexpectedly, its boughs first reached the ground, and then with an elastic spring threw the butt-end of the limb with such force upon the shoulder of the youth as to break the clavicle in numerous pieces, and contuse the soft parts so severely as to give rise to violent inflammation. The fragments had been driven behind and beneath the level of the first rib, and so compressed the plexus of nerves as to wedge them into each other, and by the subsequent inflammation to blend them inseparably together. Complete paralysis and atrophica of the whole arm ensued, and the patient's object in visiting Philadelphia was to submit to an operation, in hopes of elevating the clavicle to its natural height, and taking off pressure from the nerves. Of course nothing of the kind could be done—with any prospect of success.

The accident is easily distinguished from other injuries—by crepitation, by the depression of the humeral beneath the level of the sternal fragment, by the shoulder,—of which the clavicle is the support or stay,—falling forward upon the breast and sink-

ing below the level of the opposite shoulder, by the inability experienced by the patient in carrying the hand to the head without bending the forearm and dropping the head to meet it, and by the particular attitude which most patients assume to relieve themselves from pain—supporting the injured limb with the opposite hand, and inclining the head and body towards the affected side.

Fracture of the clavicle may occur at or near the humeral or sternal extremities of the bone. The former seldom happens, owing to the thickness and strength of the humeral portion, and to its close connexion with the scapula, to which it is tied by very firm unyielding ligaments. Fracture of the sternal end is commonly the result of counter-stroke. An interesting case of fracture of the middle bone I met with many years ago in a *child at birth*—produced by an ignorant midwife pulling at the arm.

TREATMENT OF FRACTURE OF THE CLAVICLE.

As the shoulder sinks and approaches the sternum, after the clavicle is fractured, it follows that the chief indications in the treatment, are to elevate it again to its natural height, and at the same time to carry it backwards and outwards, and there retain it by an appropriate apparatus. The first two indications had long been acknowledged as necessary, but the third and most important of all—that of keeping the shoulder *outwards*—was originally suggested by Desault, who, upon the principles just pointed out, has devised an apparatus for reducing and maintaining in contact the fragments of bone, infinitely more efficacious than any other ever invented, at the same time extremely simple in construction, and composed of materials easily obtained in any situation, however remote.

This apparatus consists of three rollers, each three inches wide and seven or eight yards long—a pad, the shape of a wedge, composed of pieces of old linen, four or five inches broad, three inches thick at the base, and in length equal to the humerus,—three compresses—a small sling for supporting the forearm—and a piece of linen or muslin large enough to cover the bandages and envelop the whole chest.

The surgeon directs an assistant, while the patient is in a

standing or sitting position, to elevate the arm of the injured side and keep it extended at a right angle with the body. He then takes the pad and placing its base or large extremity in the armpit, has it held closely to the body. See Plate X. Fig. 1.

The end of one of the rollers is now placed on the pad, and fixed by two or three circular turns around the body; the roller next ascends obliquely over the front of the chest to the sound shoulder, passes over this posteriorly, under the armpit, appears again in front of the chest, makes a circular turn nearly around the body, ascends from behind to the sound shoulder, passes over it and under the armpit, appears again on the back of the chest, and finishes by circular turns which cover the whole pad and fix it securely to the body. See Plate X. Fig. 2.

The next step of the operation is to reduce the fracture or restore the ends of the bone to their proper places. To accomplish this, the surgeon takes hold of the arm, carries it downwards, lays it closely along the pad, bends the forearm across the chest, runs his fingers along the clavicle, and adjusts the fragments.

The deformity disappears in an instant, and the principle upon which the bone is replaced immediately understood—the arm being converted into a lever of the first kind serves as the handle or power, while the clavicle forms the resistance and the pad the fulcrum or prop. To keep the bone in its position, the surgeon next takes a second roller, whilst an assistant maintains the arm in contact with the pad, and commencing at the armpit of the sound side, carries it to the shoulder of the injured side, and thence by oblique and circular turns around the body and arm, gradually descending,—each cast overlapping the other, and tightened in proportion to its descent—until it passes under the elbow as far as the middle of the forearm; this fulfils the second and most important indication—to retain the shoulder *outwards*. See Plate XI. Fig. 1.

The third and last roller must now be applied. Commencing at the armpit of the sound side, the surgeon carries the roller obliquely upwards over the injured shoulder,—previously covering the clavicle with the compresses,—down on the posterior part of the arm, under the elbow, obliquely upwards across the chest to the armpit whence it started over the back to the shoulder of the affected side, across the compresses down in front of the arm, under the elbow, across the back to the sound armpit,—from which it commences again to run the same course



Fig. 1.



Fig. 2.

From the original of a patient of the author

Fig. 1.

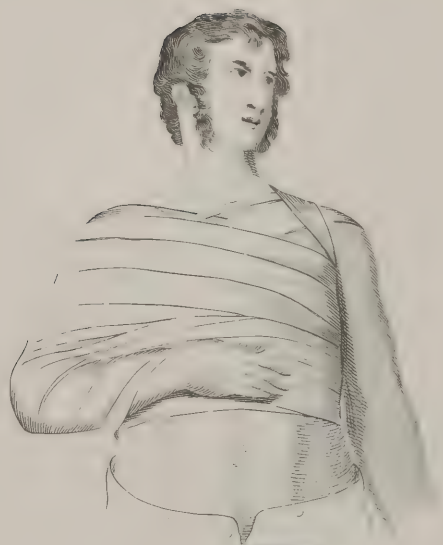
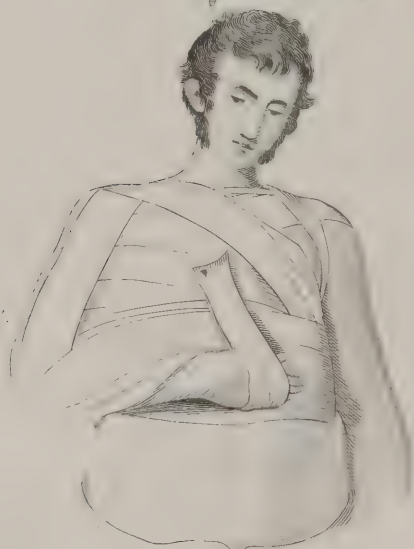


Fig. 2.



until the roller is exhausted. The bandage, when thus applied, forms a double triangle—one appearing on the back, the other on the breast—and serves to retain the arm and shoulder in their elevated position. See Plate XI. Fig. 2.

The different turns or casts of the three rollers being firmly fastened to each other by numerous pins, it only remains to apply the sling,—made of a piece of common roller passed around the hand and wrist, and pinned above to one of the bandages, and to cover the whole with a large muslin cloth. The last I have never employed, as the rollers have always remained sufficiently firm without.

The patient is relieved from pain the moment the arm is secured by the second roller, and when the operation is finished is generally able to walk about without inconvenience. In a few days, however, the bandages become more or less relaxed or discomposed, and must be replaced. There are some surgeons, however, who object to the bandages of Desault, upon the ground, chiefly, of becoming loose, and seem extremely averse to a renewal of them, as if the trouble of replacing a dressing did not fall as much within their province as its original application. Others have expressed idle fears about excoriation, high inflammation, or mortification, from the rollers being drawn with immoderate force. It is perhaps possible, (though I have never witnessed it,) if the bandages are put on in a slovenly manner, as they too often are, whether forcibly drawn or relaxed, and suffered to remain until they become foul, that excoriation may follow; and so it may from any other bandage or species of clothing. But it is the business of the surgeon to guard against such things, to lay his bandages smooth and flat, and to remove them as soon as they become loose, wrinkled, or twisted. As to high inflammation and mortification ever having followed from Desault's bandage, the idea is irresistibly ridiculous, and unworthy of serious refutation, and only proves that those who have advanced the assertion know very little, practically, about such matters. Indeed, I have commonly observed, that the surgeons who are most loud in their condemnation, and extravagant in their assertions about these bandages, have never applied them, never had control of a public infirmary, where such accidents are commonly met with, and have enjoyed very limited opportunities in private practice. The only inconvenience that I have ever known to result from the apparatus, has

occurred from pressure on the large and flaccid mammæ of old and fat females; but this so rarely happens, that it can hardly be considered as an objection to the general practice. On the contrary, the simplicity of the apparatus, the facility of obtaining the materials of which it is composed, and its efficiency when properly applied,—compared with the difficulty of procuring or fabricating machines made of straps and buckles, and quilted bands, and bolsters, all of which must be made by regular workmen, and a separate machine adapted to the size of each individual, during which days may elapse while the patient is suffering,—must, in the eyes of every sensible and experienced person, determine at once in favour of Desault's particular plan.

One thing, however, is certain, that whatever opinion may be entertained by surgeons, as to the facility or difficulty of applying the apparatus, there can be no question as to the correctness of the *principles* upon which it is founded; and that these are as susceptible of demonstration as any problem in Euclid, is equally certain. This being the case, it is, in a measure, immaterial what apparatus is employed, provided it is not too complicated, and Desault's principles are kept in view during its application. This will account for more or less of the success which has followed the numerous modifications of it in all countries, and for the ill consequences which have almost invariably resulted from attempts to treat the injury upon other principles and with other forms of apparatus. Especially will it account for the little success English surgeons have generally met with; who for the most part are adverse to Desault's views, and mainly employ the *sling* bandage, the most inefficient, contemptible, and injurious of all contrivances for such purposes. That such prejudices are now giving way to sounder views, appears probable, from a few remarks made recently by one of the best practical surgeons of that country. "Part of the apparatus recommended and figured by Desault," says Mr. Liston, "appears to be the most simple, and at the same time the most efficient. The thick wedge-shaped pad is the most essential part of it, and may be retained in its position, without so much complicated bandaging, as employed by that great surgeon. The limb is elevated; the pad, secured in the folds of a shawl, is then placed in the axilla, the thick part uppermost; the ends of the shawl are passed over the opposite shoulder, and tied in the armpits of the opposite side: soft pads are placed under the knots, to prevent galling, and ex-

coriation. Inclination of the arm to the side over the fulcrum so secured, and its still further approximation by a bandage passed round the upper arm and chest, will bring the broken bones into a proper position and retain them. A well applied sling, to preserve the elevation of the limb, completes the proceeding. In three or four weeks the union will be sufficiently firm; but, perhaps, the sling may be prudently retained a short time longer."* This is, perhaps, as near an approach to the original method of Desault's as any simple plan without rollers ever devised—with exception, perhaps, of a very neat jacket or corset made of linen or cotton, invented four or five years ago, by my friend Professor Miller of Washington, and so contrived, by a pad fixed in a pocket of the corset, as to sustain the shoulder in a very efficient way.

In conclusion I may state, that Desault's apparatus has been employed more than fifty years in the United States, and for upwards of forty of that number by the late Dr. Physick, in hospital and private practice, and that the sanction of such authority speaks volumes in its praise.



SECTION VII.

FRACTURE OF THE SCAPULA.

THE scapula, owing to its great mobility, is seldom fractured; though it is often contused, and sometimes so severely as to give rise to collections of matter between it and the chest. The acromion process and lower angle are more frequently broken than any other parts.

The *coracoid* process, owing to its retired situation, is scarcely ever injured. I have met with two cases only of this accident. The first occurred several years ago in the person of the late Charles Carroll, Esq., of Carrollton, who was upset in the carriage of Mr. Bagot, the British minister, and, by a violent fall upon the shoulder, fractured the coracoid process. The patient

* Liston's Pract. Surg., Lond. 1839.

being remarkably thin, I was able to feel distinctly the movement of the fragments of bone upon each other. I afterwards met with a similar accident in a sailor.

Fracture of the *acromion* may be known by the change in the form of the shoulder, which is sunk and flattened—being drawn downwards by the weight of the arm and the action of the deltoid muscle—by the pain, crepitation and mobility of the *acromion*, which are readily produced by raising and depressing the arm. Fracture of the neck of the scapula is sometimes met with. The accident is liable to be mistaken for dislocations of the humerus at the shoulder. Cases of the kind are reported by Sir Astley Cooper. Bony reunion seldom follows a fracture of the neck of the scapula.

The *lower angle* of the scapula, when fractured, is drawn forwards by the *serratus anticus major*, and is so completely insulated as to be easily distinguished by its inequality and unnatural position.

Longitudinal fractures of the scapula seldom occur, and are attended with little displacement, owing to the manner in which the muscles covering the surface of the bone are arranged.

TREATMENT OF FRACTURE OF THE SCAPULA.

These accidents are usually accompanied with so much contusion, as to render the removal of the inflammation that follows an object of greater importance than the treatment of the fracture itself. So profuse, in some instances has been the secretion of matter beneath the scapula, as to require the operation of the trephine for its evacuation; at least the scapula has been perforated with this view, although the proceeding has always appeared to me unnecessary, from a persuasion that the abscess, under any circumstances, might be reached by penetrating the soft parts on either edge of the bone.

Fracture of the *acromion* merely, is easily reduced and secured by elevating the arm to its natural height, fixing a pad in the axilla by a roller around the body, and binding the arm to the pad by a second roller, after Desault's manner of treating the fractured clavicle.

When the lower angle has been separated from the body of

the scapula, it is hardly possible to overcome the action of the serratus anticus muscle, so far as to restore the fragment to its former position; by a thick compress, however, placed in front of the fragment, and there retained by a roller passed around the chest, the arm being afterwards fixed by an additional roller or sling, the fractured portions may be made to approximate so closely as to leave little or no deformity. Sometimes the patient recovers sooner when confined to bed during the whole treatment.



SECTION VIII.

FRACTURE OF THE ARM.

THE humerus is very subject to fracture, and may be broken at any portion of its length—at its head, neck, middle or condyles. By the term neck of the humerus is understood among *surgical* writers, that portion intermediate to the tuberosities of the bone and the insertion of the pectoralis major and latissimus dorsi muscles.

Except in old subjects, the *neck* of the humerus is not often fractured; but among these the accident is by no means uncommon. In young persons, the epiphysis is sometimes separated from the shaft of the humerus. In either case, the upper fragment is drawn outwards by the action of the subscapularis and teres minor, while the lower one is pulled inwards by the latissimus dorsi and pectoralis major. At the same time the weight of the arm, by keeping down the lower fragment, prevents it from overlapping the upper. Sometimes, though rarely, the lower fragment is forced outwards.

Fracture of the *head* of the humerus is occasionally met with, and arises for the most part from a violent force directly applied, or from a gun-shot wound. That portion of the bone articulated with the glenoid cavity, there is reason to believe, in all such cases, is either absorbed or changed in figure. Three or four

well marked cases of the kind are contained in my cabinet, in all which the head has lost its spherical form, is very much diminished and rough and flattened next to the scapula. Similar examples are recorded by different writers.

Fractures of the neck or head of the humerus have been confounded with luxation; and much mischief has sometimes followed the mistake. These accidents, however, are easily distinguished by any one familiar with the structure of the joints and parts in its vicinity. When fractured, the head of the bone still remains in the glenoid cavity, and the rotundity of the shoulder is thereby preserved. In luxation, a hollow may always be felt under the acromion, and a tumour, formed by the displaced head of the bone, distinctly perceived in the axilla, or some other unnatural situation. Besides these signs, which in general are sufficiently indicative of the nature of each case, more or less crepitation may always be perceived when the bone is fractured, but in luxation can never be observed.

The *middle* of the humerus is oftener fractured than any other part of the bone. A direct force, a counter-stroke, or muscular action may each produce the fracture, which is usually oblique or transverse, and easily known by the mobility of the arm at the injured part, by the angular derangement, pain, crepitation, &c.

The *condyles* are frequently fractured by violence immediately applied to them. When both are broken, a longitudinal fissure commonly runs along the centre of the bone for some distance, and then terminates by a transverse or oblique division of the shaft of the humerus. When one condyle only is separated, the direction of the fracture is necessarily oblique. These injuries are often followed by high inflammation, ankylosis, and deformity of the whole arm, and should therefore be carefully distinguished from other accidents to which the elbow joint is liable. Instances are mentioned by Sir Astley Cooper* in which the condyles were fractured just above the elbow joint, and presented appearances very similar to those produced by dislocations of the radius and ulna backwards. When both condyles are fractured, the deformity is greater than when only one is separated. In either case, the crepitation is commonly very distinct upon impelling the fragments in opposite directions; and

* See a Treatise on Dislocation and on Fracture of the Joints, by Sir Astley Cooper, 4to., 1822, p. 480.

pressure upon the olecranon and bend of the arm increases the breadth of the elbow, which can only happen by the recession of the condyles from each other.

TREATMENT OF FRACTURE OF THE ARM.

The most effectual plan I have ever tried for retaining in accurate apposition the fragments of the humerus, when fractured at its *head* or *neck*, is that recommended by Desault.

The patient being seated on a chair, an assistant takes hold of the hand of the sound side and makes counter-extension; another assistant grasps the forearm of the injured limb, which is previously placed in a semiflexed position, and makes extension, while the fingers of the surgeon are employed in adjusting the fragments. The surgeon next takes a roller six or eight yards long, and commencing at the palm of the hand, carries it up the forearm and arm by circular and reversed turns as high as the shoulder, thence across the breast, around the shoulder and armpit of the sound side, then across the back to the injured shoulder, where it is held by an assistant until the surgeon places three strong splints, each two inches wide, and the length of the humerus, on the anterior, outer and posterior parts of the arm, and then resuming the roller, which is made to descend towards the elbow, secures them firmly to the limb; taking especial care to cover their extremities with tow or lint, to prevent inordinate pressure and excoriation.

Having proceeded thus far, the surgeon takes a pad, exactly similar to that used for the fractured clavicle, and placing the large end of it in the axilla,—if the lower fragment should be drawn inwards, and vice versa,—lays it along the arm, and secures it to the body. Then taking another roller somewhat longer than the one previously applied to the arm, and commencing at the armpit of the sound side he carries it to the injured arm and fastens it to the body and the pad, precisely after the manner of the second roller for fractured clavicle. The pad being fixed serves the purpose of a fourth splint for the arm, while it affords support to the fractured portion, upon which a common splint can have very little purchase. It only remains to suspend the forearm, which is fixed upon the breast in a sling, and to secure the different turns of the rollers by pins or stitches.

Fractures of the *middle* of the humerus are readily managed by a single roller, and by four splints of unequal length. The roller must commence at the hand,—a rule to be observed in all fractures of the arm and forearm,—and extend as high as the shoulder, where it is held by an assistant while the surgeon surrounds the arm with the splints, which are secured to the limb by the remainder of the roller carried towards the elbow and forearm. The hand and forearm are placed across the chest, and sustained by a sling.

The *condyles*, when fractured, are best secured by a roller and two *angular* splints,—a practice first suggested by the late Dr. Physick to obviate deformity,* which is extremely apt to follow all fractures about the elbow joint. The fracture being reduced and the forearm bent, a roller is applied in the usual way, and extends as high as the shoulder; the surgeon then takes the splints,—about two inches broad, long enough to extend from the shoulder to the elbow, and from the elbow two or three inches beyond the fingers, in shape somewhat resembling a workman's square,—and applies one on the outside, the other on the inside of the limb, and secures them by the remaining part of the roller. To prevent ankylosis, the dressings should be taken off frequently, and renewed after repeated but gentle flexion and extension of the joint. After two or three weeks the rectangular splints may be laid aside, and others substituted more obtuse in the angle.



SECTION IX.

FRACTURE OF THE FOREARM.

THE radius and ulna may both be fractured at the same moment, opposite each other, or upon a different level. Usually the

* "The deformity alluded to consists in an *angular projection of the elbow outwards*. It is most evident when the whole arm is placed at right angles to the body with the thumb upwards, the patient standing erect. In that case, instead of a gentle curve downwards at the elbow, which is natural, the curve is directly reversed."—*Dorsey's Surgery*, 3d edit. vol. i. p. 168.

fracture occurs about the middle of the bones, and is transverse or oblique, while the derangement is either angular, or in the direction of the diameter of the bones.

The radius is oftener fractured than the ulna, because it is connected with the bones of the carpus, and therefore liable to receive directly any shock communicated to the hand. The fracture occurs near the wrist, at the middle, but rarely at the upper extremity of the bone. Receiving partial support from the ulna, which serves as a splint, the deformity is less than in fracture of both bones. By placing a finger upon the upper extremity of the radius, while the lower part is made to turn on its axis, by moving the hand, the superior fragment, if fractured, will remain stationary; but, on the contrary, if entire, it will move with the rest of the bone, and afford very conclusive evidence of the nature of the case.

Fracture of the *ulna*, commonly occurs towards the lower or smaller extremity of the bone, sometimes about the middle, but seldom at the upper extremity. The accident is easily known by the crepitation, deformity and mobility of the lower fragment, when the separation takes place below the elbow.

The *olecranon*, which constitutes the summit of the ulna, may be fractured by direct violence or by inordinate action of the triceps muscle. The former is the most frequent cause, and is generally produced by a fall, in which the patient catches upon the elbow in the act of saving the body. As soon as the fracture occurs, the process is drawn upwards by the triceps, and separated a greater or less distance from the shaft of the bone. The space thus produced is increased upon bending the forearm, and diminished by extending it—signs so perfectly decisive of the character of the fracture as generally to render other evidence unnecessary. Sometimes, however, the tumefaction around the joint is so considerable as to prevent satisfactory examination, at least for several days.

The *coronoid* process is sometimes fractured. One instance of the kind occurred to the late Dr. Physick, two are mentioned by Sir Astley Cooper, and another by Mr. Liston. "The coronoid process," says he, "is occasionally pulled or pushed off from the shaft, more especially in young subjects. I saw a case of it lately, in which the injury arose in consequence of the patient, a boy of eight years, having hung for a long time from the top of a high wall by one hand, afraid to drop down."

TREATMENT OF THE FRACTURE OF THE FOREARM.

With exception of the olecranon, fractures of the bones of the forearm should be treated upon the same principle. Whether one or both bones be broken, the limb is placed in the bent position and counter-extension made by an assistant, who grasps the arm above the condyles; another assistant keeps up extension by pulling at the hand, and the fingers of the surgeon are employed in compressing the muscles situated between the bones, in order to force the fragments outwards or in a lateral direction, and thereby prevent them from encroaching upon the interosseous space. Having restored by these means the natural form of the limb, the surgeon applies two graduated compresses,—about three inches wide, the length of the hand and forearm, and half an inch thick at the base,—one on the anterior, the other on the posterior part of the forearm and hand—the base of each being placed downwards. Over these are placed two splints, equal in length and breadth to the compresses, one in front, the other on the back of the limb, to which they are fastened by a roller. The compresses serve the double purpose of rendering the limb throughout of uniform thickness, and of creating pressure upon the muscles between the interosseous space. Two splints are quite sufficient to keep the bones firm; indeed, additional ones, by making lateral pressure, would prove injurious, and counteract the design of the compresses. The splints in every instance should extend to the extremities of the fingers and afford complete support to the hand, otherwise deformity will ensue, from the radius crossing the ulna and following the movements of the hand. From inattention on the part of surgeons to these circumstances, and especially from the palm of the hand not being kept fairly applied to the surface of the chest, with the thumb directed upwards, and the whole forearm supported in a sling, I have known several instances of very great deformity arise, followed by irrecoverable loss of the use of the limb. One of the worst cases of the kind I ever saw, was shown to me lately by Dr. Chase, as having occurred recently in the practice of a physician of this city. Pronation and supination were entirely destroyed, the hand turned off at right angles from the radius, and the two bones twisted, spirally, upon each other. The treatment I have

advised, when properly conducted, without variation, will answer extremely well either for the radius or ulna individually, or for fracture of both bones.

Fracture of the *olecranon* requires a very different management, and is not so easily secured. Instead of flexing the forearm, which would tend to separate widely the fragments, it is placed in the extended position, and there retained, while a roller, several yards long and three inches wide, is applied by circular and reversed turns as high as the elbow, when it is given to an assistant until the surgeon draws down with his fingers the fragment of olecranon attached to the triceps, and brings it in contact with the lower fragment; the roller being then resumed, is passed obliquely by several successive turns around the joint and above the insertion of the triceps, in form of the figure 8; thence it is continued by circular turns up the arm, and made to compress the muscles firmly. The bend of the arm is next filled with lint or tow, and over this is placed a firm splint, long enough to extend from the middle of the arm to the same distance on the forearm. The splint is completely covered by the roller, and serves to preserve the extended position and to ensure the contact of the fragments.

When properly managed, the fractured olecranon unites in a much shorter time and with less deformity than is commonly imagined. Under any circumstances, however, it is difficult, owing to the incessant action of the triceps and the little purchase offered by the olecranon to act upon, to preserve the fragments so closely together as to bring about ossific reunion; instead of which a ligamentous substance, abundant in proportion to the space between the fragments, is secreted, and forms the connecting medium. Owing to this, the arm long remains weak, and sometimes never recovers its former strength.

When the *coronoid* process is fractured, there will be a constant tendency to displacement of the ulna backwards, so that the accident resembles luxation of the bones of the forearm posteriorly. By pulling the forearm, however, and at the same time bending it, the deformity is removed, but quickly returns unless prevented. The best mode of treating the injury is to preserve the limb in the flexed position for several weeks.

Fractures of the lower extremities of the ulna or radius, within an inch or two of the wrist, either separate or conjoined with luxation, are by no means unfrequent, and are often mistaken for

sprains, bent bones, as they are called, or other injuries. Many writers have of late years referred to such cases, and important information in relation to them will be found in the writings of Colles, Liston, Dupuytren, and more especially in a short essay by Dr. J. R. Barton of this city.*

SECTION X.

FRACTURE OF THE HAND AND FINGERS.

THE bones composing the *carpus* or wrist are so compact and firmly united to each other, as to resist effectually any common force applied to them; they are sometimes broken, however, by great and direct violence, in which case the soft parts suffer in proportion.

The *metacarpus* is sometimes fractured by a force immediately applied, but seldom in any other way. In several instances I have known these bones very much shattered by the bursting of a gun, while the patients were grasping the barrel with their left hand. In one case a very fine youth† lost his life from carelessly crossing his hands over the muzzle of his piece, and resting one foot on the lock; by which the cock was pushed back, the gun discharged, and the contents driven through both hands, tearing up the metacarpal bones in a shocking manner, and producing tetanus in a few days.

The *fingers* are sometimes broken by machinery, mashed by heavy weights, or caught within the fold of a door. In such cases they may be fractured in several places, dreadfully bruised, or nearly divided. When simply broken, without much injury of the soft parts, the accident is comparatively trivial, and easily distinguished by the deformity, crepitation, &c.

* See American Journal of Medical Sciences, No. li. 1840.

† Son of G. W. Esq., of Baltimore.

TREATMENT OF FRACTURE OF THE HAND AND FINGERS.

When the carpal and metacarpal bones have sustained serious injury, we have more cause to dread the effects of inflammation, than any mischief that may result from the fracture merely. Frequently the necessity of amputation is clearly indicated; at other times an attempt to save the hand or a part of it must be made.

The fingers, when simply broken, should be surrounded with a narrow roller, and sustained by four splints made of binders' boards, two of which should extend as high as the wrist, and the others the length of the finger merely.

Fingers that have been very much lacerated, nearly separated, or hanging by shreds, should always be replaced, and reunion attempted; for it has happened, as in the cases formerly referred to and detailed by Balfour, that adhesion has been accomplished even after the total separation of one or more phalanges. It is much more important, indeed, than commonly imagined, to save even the smallest portion of a finger, and more especially of the thumb; but we should be governed in a measure, in all such cases, by the age and constitution of the patient; for if tetanus should ensue, the chance of recovery can hardly be calculated upon.



SECTION XI.

FRACTURE OF THE PELVIS.

THE bones of the pelvis are rarely fractured, owing to their great strength and the unyielding texture of the ligaments by which they are tied together. Such injuries, when they do occur, are always the result of great violence, and on this account usually have an unfavourable termination.

Of the individual bones, the *innominatum* is perhaps most liable to fracture, and commonly from force directly applied, as

when a patient is squeezed against a wall or post by the wheel of a cart, or by the passage of the wheel of a wagon, heavily laden, over the hips while lying on the ground. In such cases both bones are generally crushed inwards.

The *sacrum* may be fractured, or severely contused, by falls from a height upon the buttocks, from which more or less concussion results, or injury to the sacral nerves. But the most formidable accident is fracture of the innominatum combined with that of the acetabulum, especially when the bones separate so far as to allow the head of the femur to enter the pelvis; in which case the thigh is shortened, and the injury may be mistaken for luxation. It can be distinguished from it, however, by the crepitation produced by moving the fragments in opposite directions, and by the eversion of the foot.

The *os coccygis* is sometimes fractured in old subjects, but seldom in young ones, owing, in the latter, to the great mobility of the bone.

In all cases where the shocks communicated to the pelvis are violent, whether the bones be fractured or not, symptoms resembling those from injuries of the vertebræ are apt to arise—such as paralysis of the extremities, incontinence or suppression of the urine, &c.

TREATMENT OF FRACTURE OF THE PELVIS.

Little benefit will result in these cases from splints and bandages, and the treatment should be chiefly directed towards the removal of inflammation, which is best accomplished by copious depletion, low diet, and perfect rest. In addition, the catheter, if required, must be used two or three times a day, and care taken, by the application of adhesive plasters to the parts that sustain the greatest pressure, to prevent ulceration and sloughing.

When abscesses form within the cavity of the pelvis, or on its outer surface, under the *glutæi* and other muscles, they should be opened speedily, to prevent diffusion, and any spicula of bone removed by the forceps. To enable the patient to procure stools, without disturbing the parts injured, some one of the numerous modifications of Earle's bed may be resorted to, or, still better, the apparatus of Jenks—described and figured under the head of Fracture of the Thigh.

SECTION XII.

FRACTURE OF THE PATELLA.

MUSCULAR action is the most common cause of fracture of the patella; hence the accident usually occurs amongst dancing-masters, circus-riders, and persons much accustomed to the exercise of leaping. The bone may be broken, also, by force directly applied to it, especially if the knee be bent at the time the injury is received; in which case the centre of the patella, being unsupported by the heads of the femur and tibia, is the more apt to give way. From whatever cause the accident proceed, the direction may be transverse, oblique, or longitudinal.

The *transverse* fracture, however, is infinitely more common than the rest, and is easily known by the upper half of the patella being mounted upon the anterior part of the thigh four or five inches above its natural position, being drawn thither by the combined action of the rectus, cruræus, and vasti muscles. Besides this sign, which is very unequivocal, a manifest hollow can always be felt and seen at the knee, into which the fingers may be pressed as far as the integuments will allow; the patient, moreover, falls to the ground, is unable to rise without assistance, cannot walk, and is generally sensible at the moment of the fracture of an audible noise or smart report.

When the fracture is *longitudinal*, none of these symptoms exist, because the fragments still retain their position, or at least can only be made to separate from each other laterally, or in the direction of the breadth of the knee.

Compound and *complicated* fractures of the patella fortunately are not very frequent; they are always attended with immense risk, and may terminate fatally, or in incurable lameness. Interesting cases of the kind have been reported by Sir Charles Bell, and others.

The patella, when once fractured, ever after remains comparatively weak, and is very prone to a recurrence of the injury. This arises from the difficulty, perhaps impossibility, of maintaining the fragments of a transverse fracture in *exact* apposition: bony matter is therefore not secreted in sufficient quantity to fill up the vacuity, and its place is supplied by a ligamentous substance, which, for a long time after the accident, continues soft

and is easily torn. It is true, that bony matter has been found on dissection; but instances of the kind are so extremely rare, as not to affect the general position—that the bond of reunion, except in longitudinal fractures, is ligamentous. This has, moreover, been confirmed by the experiments of Sir Astley Cooper, and others, on inferior animals.

A fracture of the patella in one limb is very apt to be followed by a similar injury in the other—owing, perhaps, to the sound limb sustaining, for a long time after the first accident, more than its proportion of the weight of the body, and performing a greater variety of offices.

TREATMENT OF FRACTURE OF THE PATELLA.

Various means have been employed to overcome the action of the extensor muscles and retain the fragments together; but the plan devised by Desault I have always found the most simple and effectual.

A splint two inches wide, long enough to extend from the tuberosity of the ischium to a short distance beyond the heel—two rollers, each six yards long and three inches wide—another roller or compress, somewhat longer than the thigh and leg, are the materials of which the apparatus consists. The thigh being bent on the pelvis, and the leg extended on the thigh, is supported by an assistant at a considerable elevation, whilst another assistant stands at the pelvis and keeps it fixed. The surgeon then takes the short roller or compress, and extending it on the anterior part of the whole limb, gives an end to each of the assistants, who keep it tense. One of the long rollers is next passed around the instep by two or three circular turns, so as to enclose and secure the end of the compress, and is then passed by reverse and circular turns as high as the knee, when it is given in charge to the assistant who stands at the pelvis. The surgeon now makes two longitudinal slits with a penknife or scissors in the compress, corresponding with the situation of the knee-pan; through each of these a finger is introduced, and the patella drawn down and placed in contact with its lower portion; the roller is then resumed and carried around the joint, above and below both fragments several times, in form of the figure 8. These oblique turns being crossed by circular ones, the roller is continued up the thigh, and terminates by fixing securely the upper extremity

of the compress. The use of the compress, it will now be seen, is to prevent, on the one hand, the casts of the roller on the leg from slipping downwards, and on the other, those applied to the thigh from ascending by the action of the extensor muscles.

The limb being still sustained in its elevated position by the assistant standing at the foot, the surgeon next takes the splint, and placing one end under the ischium, lays it beneath the thigh, leg, and heel; then filling up the inequalities of the limb with lint or tow, and padding the parts well, with either of these materials, upon which the greatest pressure is made by the splint, the remaining long roller is passed, commencing at the ankle, around the splint and limb, connecting the one firmly to the other throughout their whole extent. It only remains to retain the limb in its elevated situation. This is easily accomplished by forming an inclined plane, composed of pillows, the highest part of which is placed at the heel.

Whenever the bandage becomes relaxed, which it generally does in six or eight days, it must be reapplied. The inclined plane should be examined daily, and never suffered to sink beyond the level at which it was first placed. In sixty or seventy days the fragments are usually consolidated; but the patient should be very careful not to try, for a long time, the strength of the limb, or to exert more force upon it than the intermediate ligamentous substance may be able to bear. Sir A. Cooper reports a case where the ligamentous reunion was afterwards destroyed by *ulceration*. I have met with three or four instances, where a rupture of the adventitious ligament took place from premature or undue exertion.

SECTION XIII.

FRACTURE OF THE THIGH.

THE *os femoris* being very long, somewhat curved, and surrounded by powerful muscles, is frequently fractured. The frac-

ture may take place at the head, neck, shaft and condyles of the bone, either in a transverse or oblique direction. Compound and complicated fractures of the femur may also occur, though such accidents are comparatively rare.

Fracture of the *neck* of the femur may happen within the capsular ligament or exterior to it. The former is most common, and met with almost exclusively in very old subjects; the latter may occur at any period of life. Women, moreover, on various accounts, are more liable to fractures of the neck of the bone than men. It seldom happens that the neck of the os femoris is broken by a direct force. A counter-stroke, or twist of the limb, is the most frequent cause of it. Thus, a fall upon the trochanter or upon the feet, by which an impulse is communicated to the bone, will often fracture it obliquely or transversely. The latter direction is most common. A very slight twist of the pelvis or thigh in an old subject will sometimes be sufficient to break the neck within the capsule. I have known it happen from the patient's attempting suddenly to turn round, while the foot remained fixed by some slight irregularity on the floor.

The *signs* of this fracture are, in general, very evident. Instead of retaining its natural length, the limb is drawn upwards, the shaft of the bone lodged on the ilium, the foot turned outwards, and the trochanter major inclined backwards. In addition the limb can be restored without difficulty to its natural length, but reascends as soon as the extension is discontinued; again—upon rotating the thigh on its axis, whilst a hand is laid upon the trochanter, this projection will be found to turn, as it were, upon a pivot, whereas in the entire state of the bone, it describes the arch of a circle, the radius of which is formed by the neck of the femur. Other signs have been enumerated; but these, taken collectively, will generally prove sufficient to indicate the nature of the injury.

From inattention to these signs, from the complicated character of the injury, or the length of time it has existed, many instances have occurred of fractures of the upper extremity of the thigh bone being mistaken for luxation and treated accordingly. During the winter of 1835, a case of this description occurred at the Pennsylvania Hospital, under care of Dr. J. R. Barton, who applied pulleys for some time before he discovered the true nature of the injury. I only mention the circumstance to show that if so good a surgeon as Dr. Barton could commit such an

error, how much more likely it would be to happen in the hands of ordinary practitioners.

The *prognosis*, as respects reunion of the fragments after fracture of the neck of the femur within the capsular ligament, is as unfavourable as can well be imagined. Scarcely, indeed, is it possible to find on record a well attested example of perfect *bony* reunion after such an accident. It is true that many alleged specimens of the kind have been brought forward, especially of late years, but few if any have been able to stand the test of rigid scrutiny, and upon examination have turned out to be fractures of the neck of the bone on the outer side of the capsular ligament.* Although reunion is never accomplished, however, in some subjects, especially very old and infirm ones, and the fragments remain for ever insulated, it must not be inferred that this invariably happens; for even under the greatest disadvantages, nature always makes an effort towards reparation, and often succeeds so far as to effect a ligamentous reunion similar in some respects to that which occurs in fracture of the patella and olecranon. Still the joint remains weak, imperfect and deformed, and never able afterwards to sustain the full weight of the body, or to encounter shocks which originally it was accustomed to bear with impunity. This imperfect reproduction may be owing to two or three different causes—to the portion of bone connected with the acetabulum being deprived of its vascularity or nutriment by the rupture of the periosteum and reflected membrane of the cervix femoris, upon which it chiefly depends for the supply of blood; the quantity which it receives through the medium of the round ligament, and upon which it must now mainly depend, not being sufficient for its support—to a wide separation of the fragments, from muscular action or want of appropriate means to keep them in apposition—and to a copious secretion or accumulation of a serous fluid within the capsule of the joint, which by its interposition and circumfusion effectually cuts off all interchange or connexion between the separated fragments.

As already remarked, fracture of the neck of the femur may take place exteriorly to the capsular ligament; in this case the

* Latterly a few undoubted specimens of bony reunion have been brought forward—one by my friend, Dr. Mussey, the distinguished professor of surgery at Cincinnati, and another by Sir Astley Cooper, who for a long time could not be prevailed upon to admit the correctness of most statements on the subject.

diagnostic marks do not differ materially from those pointed out as belonging to fracture of the same bone within the capsule; the result, however, both as respects the deformity and utility of the limb is very different: for in fracture on the outside of the capsule, perfect bony reunion, from a full vascular supply, is soon established, and the limb becomes as strong as ever. Where the fracture is partly within and partly without the capsule, the bony reunion may be perfect. One instance of the kind I met with in a lady of ninety-six, attended by Dr. Chapman and myself, in 1828. A post-mortem examination, twelve months afterwards, revealed perfect consolidation of the fragments.

Fracture of the *trochanter major* alone, sometimes occurs. In this case, the shaft of the femur remaining entire, no shortening takes place. The accident may be known by the mobility of the trochanter, and by its being drawn upwards or towards the ilium.

The *middle* of the os femoris, in young subjects, is perhaps more liable to fracture than any other portion of the bone. This arises from its exposed situation, and from its being more under the influence of muscular action. There will be an essential difference in the nature of the accident, especially as regards the result of the treatment, according to the direction of the fracture. If there be a transverse fracture, the ends being fairly supported against each other, little or no deformity will ensue. If the fracture be oblique, the ends overlap, and the inferior fragment is generally drawn for several inches upon the posterior surface of the upper fragment, and hence a shortening of the limb, followed by all those difficulties which have been complained of from time immemorial. The higher, however, the fracture is situated upon the shaft of the bone, the greater will be the overlapping, because a greater number of muscular fibres will be employed in producing the retraction. The signs indicative of fracture of the middle of the bone, correspond, in most respects, with those of fracture of its neck.

Like the *condyles* of the os humeri, those of the femur may both be broken, or only one. In the former case, crepitation, together with shortening of the limb and a facility of increasing the breadth of the knee by pressing upon the patella, will be sufficient to distinguish the accident from any other affection. Compound fracture of the femur just above the condyles, especially when the fracture is oblique and the superior fragment

penetrates the rectus muscle, should always be considered a very grievous accident, and liable to terminate in death or amputation.

TREATMENT OF FRACTURE OF THE THIGH.

Had the surgeon no other difficulties to encounter than such as present themselves after simple transverse fracture of the shaft of the thigh bone, he would have little reason to complain of the defectiveness of art, or of the power of nature in promoting a cure. So different, however, from this is the result of an oblique fracture of the body of the bone, or of a transverse fracture of its neck, that it is hardly possible in any case to calculate with certainty upon reunion without more or less shortening and deformity of the limb. The remark will apply most forcibly to fracture of the cervix femoris within the capsule, and the surgeon should be careful in such cases how he ventures to promise a favourable result, especially in very old subjects. Indeed, as respects these cases, I have strong doubts of the propriety of attempting more for the relief of the patient, than merely keeping him as quiet and as easy as possible, by supporting the hips with pillows and retaining the limb as much in the extended position as can be borne. If extension and counter-extension, however, should be deemed admissible, then recourse must be had, I conceive, not to the means commonly employed, but to others I shall presently point out.

Without recounting the various contrivances that have been used at different periods for effecting extension and counter-extension, most of which are detailed at length in the different works written expressly on fractures, I shall merely speak of the means which have commonly been employed in this country within the last twenty or thirty years, and of such recent European and American inventions as may appear deserving of notice.

The celebrated Desault, it is well known, employed an apparatus consisting of a strong splint, long enough to reach from the spine of the ilium to four inches beyond the foot; of another splint, extending from the perineum to the sole of the foot; of a third, the length of the thigh itself. To these were added extending and counter-extending bands, junks, or long narrow bags filled with chaff, the bandage of Scultetus, a splint cloth, &c.

The whole being arranged, extension was made from the foot by passing the band around the ankle, and fixing it to the lower end of the long splint, counter-extension from the perineum, securing the end of the band to the upper extremity of the splint.

The late Dr. Physick, having in several instances tried the apparatus of Desault, found it defective, chiefly on account of the obliquity of the action of the counter-extending band, which, owing to the splint not extending above the spine of the ilium, passed across the upper fragment of the femur and forced it outwards. Again—the extending band, by pulling the foot outwards and pressing it against the lower extremity of the splint, sometimes occasioned troublesome excoriation. To obviate these inconveniencies, Dr. Physick modified the apparatus in the following way. The long external splint, instead of terminating at the hip, was made to ascend as high as the armpit, where its extremity was formed like the head of a crutch, and padded to take off pressure from the axilla. Immediately below the crutch-like head of the splint, a hole or mortice was made, sufficiently large to admit the end of a handkerchief or counter-extending band. The lower end of the splint, at the suggestion of Dr. Physick, was altered by Dr. James Hutchinson, then a student at the Pennsylvania Hospital. The alteration consisted merely in attaching to the splint, a little above its lower end, a small block, which, projecting inwards at a right angle with the splint, and being notched at its extremity, served to receive the extending band, and by diverting it inwards, to prevent excoriation of the external parts of the foot, and to keep up extension precisely in the direction of the limb.

Previous to the application of the apparatus thus modified, a common bedstead, between two and three feet wide, the bottom of which is covered with wooden slats instead of sacking-bottom, is selected; over this is placed a firm and even mattress, a sheet above it, and a pillow for the patient's head. Commencing about the middle of the mattress, five or six pieces of broad tape, a yard in length, are laid upon the sheet transversely, and placed eight or ten inches from each other. Next a *splint cloth*, or piece of muslin, a yard and a half long and a yard wide, is placed above the tapes—its longest diameter running parallel with them. Over the middle of the splint cloth, near its upper edge, is then laid, longitudinally with respect to the mattress, a

splint of binders' boards, two inches broad, nine long, and above and across the splint the bandage of Scultetus. This is made of a common roller two or three inches wide, divided into strips long enough to surround the thigh and overlap. The first strip is laid near the upper edge of the splint cloth, the second overlaps about an inch and a half, and the others are similarly arranged and in regular succession, until a sufficient number are laid down to equal the length of the thigh. Two bags filled with chaff or cut straw, extending from the hip to the foot, and four inches wide, are then prepared. Lastly, three silk or Madras handkerchiefs, each about a yard long, previously washed and folded diagonally, and the three wooden splints—the long external one, the internal one reaching from the perineum to the foot, and the short one the length of the thigh—are placed within the surgeon's reach.

Every arrangement being made, the patient is placed on the bed by careful assistants, and the injured thigh, (previously stripped of every species of clothing,) laid in the centre of the dressings without disturbing them in the slightest degree. One of the handkerchiefs is then passed around the ankle and instep of the injured limb, somewhat in the form of the figure 8, knotted under the sole of the foot, and its ends given to an assistant; another is carried along the perineum, between the genitals and thigh, and its ends, which pass above the pelvis before and behind, delivered to a second assistant. By these extension and counter-extension are next made, while the surgeon, after having adjusted the fragments and restored the natural shape of the limb, applies the bandage of Scultetus by commencing at the strip last laid down, or that nearest the knee. The ends of this are brought over the front of the thigh and crossed; a second strip secures the first, and in like manner all are made to overlap until the whole thigh is covered, when the last strip is fastened by a pin. The two long splints are next rolled in the splint cloth, and thus covered, are brought alongside the limb, leaving a space merely sufficient for the interposition of the bags of chaff which are then applied, and serve to fill up inequalities and to prevent the splints from irritating the thigh and leg. Now the extending and counter-extending bands are fixed by the assistants in their respective places—one being carried around the notched extremity of the projecting block situated near the end of the external splint and tied to a mortise below it, the other drawn

nearly in a line with the body and secured to the mortise at the upper end of the splint. The short splint being laid over the front of the thigh, and the third handkerchief passed around the external splint and the pelvis, the tapes are all drawn around the limb and splints, and tied, and the operation finished.

It is well known, that in fractures of the os femoris, the extended and semi-flexed positions have each been extolled by their different advocates as the most appropriate. The former is the most ancient, and can be traced as far back as the time of Hippocrates. The latter is, comparatively, of modern date, and was introduced into practice chiefly by the celebrated Pott. But though the extended was the position usually employed by the ancients, and by many of the older surgeons, in imitation of them, yet, owing to their rude and imperfect contrivances, very little benefit resulted from the practice, and we are indebted to the distinguished Desault for the first systematic and rational attempt, by extension and counter-extension, to overcome difficulties, which were considered almost insurmountable. The indications pointed out by that surgeon having been already stated, let us see how far they are calculated to answer the purpose. The lower fragment of bone, drawn by the action of the muscles, past the other, is mounted upon the thigh, the limb is shortened and the foot turned outward; the surgeon draws down the foot and leg, coaptates the broken extremities of bone, places the limb in its natural position, fastens his extending and counter-extending bands, and preserves, as he imagines, the limb of its natural length. But are his views really accomplished? Can he exert sufficient force to overcome the resistance of the muscles and prevent the retraction of the bone, or if he actually accomplish this for a limited time, do not his bands speedily yield, become elongated and twisted like a rope, and by being relaxed, permit the muscles again to act, and the bones to resume their unnatural position? Again—admitting the texture of the bands to be such as not to suffer extension, are the soft parts covering the ischium and ankle—the principal points of action—incompressible? On the contrary, is not the principal pressure especially in fat subjects, sustained by them; and what is the inevitable result of this pressure, if rigorously kept up?—*ulceration*, perhaps *sloughing*. These are difficulties, which every candid man, who has had much experience in the treatment of a fractured thigh, will acknowledge to exist, which Desault him-

self, in part acknowledged, and which every one, who pays the slightest attention to the subject, will find to be strictly true. "Like all other kinds of apparatus," says he, "formed principally of rollers, this is very subject to become relaxed, and requires great attention on the part of the surgeon. It ought to be examined attentively every day, particularly the two extending bandages. As soon as they become relaxed, they must be immediately tightened again: without this precaution, *the effect of the apparatus will be lost*. Be vigilant also with respect to the compress placed between the roller and the tuberosity of the ischium. Should this slip, the roller being frequently tightened, and pressing immediately on the skin, *may produce excoriations and ulcers difficult to be healed*, especially in females. The roller itself may slip, and then leaving no longer a solid point of support and action on the tuberosity of the ischium, it makes extension in but an imperfect manner." But are these the only objections? Has it not been proved by experience that the perineal band, from its transverse action on the thigh, has a tendency to throw the superior fragment of bone outwards? Again, does not the extending band, owing to the obliquity of its action, force the foot preternaturally outwards? It may be answered, perhaps, that the ingenious improvements of the late Dr. Physick, and Hutchinson, upon the original apparatus of Desault, have, in a measure, obviated these difficulties. This we are very ready to allow, but still they exist, to a certain extent, and as such impair the value of the whole. So far as my own experience goes,—which amounts to more than thirty years, during the greater part of which time I have had the chief control of the surgical cases of large hospitals and almshouses, together with an extensive private practice,—I am ready to declare, that I have never met with a single instance of *oblique* fracture of the thigh bone, in which I have used the apparatus of Desault, that more or less ulceration of the perineum and foot, and shortening of the limb, were not the consequence. On the other hand it is proper to state, that during the long and extensive practice of the late Dr. Physick, cases have occurred in which cures have been produced by the apparatus of Desault,* as modified by himself and Dr. Hutchinson; and there can be no doubt, notwithstanding the objections already advanced to Desault's splints,

* Most of these, there is reason to believe, were transverse and not oblique fractures.

that compared with other apparatus and that too proposed as improvements on them, they are in many respects superior. This especially holds good as regards the apparatus of *Boyer*, which does not differ from that of *Desault* in principle, but is very inferior to it—being very complicated and expensive, and therefore not adapted to common practice. On the contrary, the greatest advantage possessed by the original contrivance, is its *simplicity*—the materials of which it is composed being always at hand, or prepared in a very short time. The padded straps of *Boyer*, although certainly better than the bands of *Desault*, are yet liable, as I have found, to produce more or less of the same inconvenience—*ulceration*. Upon the whole, it may be stated, that the plan of *Desault*, as modified by *Dr. Physick*, is better calculated to fulfil the indications for which it was designed, than any other acting upon the same principle; but that if the same end, namely, extension and counter-extension, can be effected upon a *different* principle, without injuring the perineum, as shall afterwards be shown, advantages must be gained which the other can never possess.

The semiflexed position, so strenuously commended by *Mr. Pott*, and followed by the British surgeons, almost without exception, is one against which, as a general practice, many objections may be urged. It must be evident, even to the most careless observer, that if the thigh be bent on the pelvis, its outside resting on the great trochanter, the body of the patient inclining to the same side, the leg bent upon the thigh, and the whole limb in a state of semiflexion, (the plan advised by *Mr. Pott*,) that not the slightest power can be exerted upon the limb, either in confining it to one position, or in effecting extension and counter-extension—the only process by which the broken extremities of the bone can be prevented from riding upon each other. If splints are placed on the thigh while in this position, it is obvious that they can extend only throughout its length, and consequently must either prove altogether inoperative, or, at best, only serve to give lateral support to the limb, without effecting, in the slightest degree, its longitudinal extension. The position itself, moreover, independently of other considerations, is by no means so easy and comfortable for the patient, as has been alleged, or as might be imagined from the relaxed state of some of the muscles. Indeed experience has sufficiently proved, that although immediately after the accident

the patient suffers less while the limb is kept in the semiflexed position than he does when it is placed in the extended one, yet in the course of a few hours, this very position becomes so irksome as hardly to be sustained, and creates an incessant desire to have it changed. On the contrary, the extended position, even from the first, is attended with no great inconvenience, and finally is found so free from pain, that there is reason to believe the patient would not voluntarily change it, if permitted so to do. Every one knows, indeed, that it is much easier to lie for a considerable length of time on the back than on the side, even while in health; it may easily be conceived, then, how tedious and fatiguing must be the patient's situation, when not only his broken limb is confined to an uncomfortable posture, but his body also. Much has been said by the advocates for the semiflexed position, of the *entire* relaxation of the muscles of the limb, while in that position. But is this really the case? Certainly not; for however much we may relax the triceps, semitendinosus, semimembranosus, sartorius, gracilis and others, yet there will remain a sufficient quantity of muscular power to draw up the inferior fragment, and counteract all the benefit we might expect from position alone. While it must be acknowledged then, that in the bent position the *greatest* number of muscles are relaxed, yet it does not follow that this must be the easiest for the patient, or the most effectual in preventing deformity and effecting a cure. Besides these inconveniences, however, attending the bent position, there are others not less objectionable. Much of the superincumbent weight of the body, and the greater part of the weight of the thigh, are sustained by the *trochanter*. This is necessarily productive of great pain, and sometimes of very troublesome ulceration, and on this account renders the semiflex attitude particularly inconvenient in cases of fracture of the *neck* of the thigh bone, and more or less irksome and disagreeable even in the more simple cases. Again—the surgeon finds it impossible, when the thigh is thus situated, to compare its length with that of the opposite thigh, and consequently must be at a loss to know the extent of the shortening and deformity. More or less movement, also, of the fractured portions, must necessarily follow every attempt on the part of the patient to have a stool, and in many cases this cannot be accomplished except by an entire change of the body and limb. Should it so happen, that both thighs are broken at the same time, an ac-

cident which sometimes happens, it must be apparent that Pott's method, allowing it to be free from every other objection, cannot possibly be employed. Lastly, it may be urged, as an objection to the semiflexed position, that after consolidation of the fragments has taken place, shortening of the limb from the overlapping of the bones is not the only deformity produced; the thigh is seldom straight, and the leg, from being so long bent on the knee, does not recover for a great while, if ever, its natural position, but is suspended in such a way as to prevent the foot from reaching the ground, so long as the stiffness or false ankylosis exists. The same position is preserved for a greater or less time by the thigh, from the circumstance of its being flexed on the pelvis, and in cases of fracture of the neck of the bone, this position is extremely apt to be permanent, so that the thigh projects preternaturally forward, while the leg being carried backwards, and suspended from the knee, the whole limb is greatly deformed, and permanent lameness ensues. The slightest reflection will convince any one, that if under the circumstances mentioned, the limb be placed in the extended position, even although ankylosis should follow both at the hip and knee, and the fragments of bone overlap, yet the patient will derive much more benefit from a limb thus stiffened and shortened, yet straight, than he could, if it were permanently retained in the flexed position.

Sensible of the difficulties to be encountered, and of the disadvantages attending the treatment of fractured thighs by the peculiar method of Pott, several English surgeons have endeavoured to retain the semiflexed position, which in some respects they consider the most appropriate, and at the same time to keep up extension and counter-extension. To accomplish this, Mr. White, of Manchester, was the first, I believe, to propose a triangular frame, so constructed as to form an inclined plane, over which the thigh, flexed on the pelvis, and the leg on the thigh, were placed and suspended, as it were, above the level of the patient's body. Upon this machine an improvement was afterwards made by Mr. James of Hoddeson, which consisted chiefly in rendering the angles of union of the inclined boards flexible by hinges, and moveable by a rack, so as to adapt the apparatus to any sized patient, and to change at pleasure the degree of semiflexion. This apparatus has been employed by Sir Astley Cooper, in London, for the last twenty years, and is

still considered by him more appropriate than any other.* Sir Charles Bell,† also, apparently without the knowledge that any such contrivance had been before employed, has described and figured a machine differing somewhat in shape, but not in principle from the one last mentioned. It will be easy to perceive the manner in which any apparatus thus constructed acts. The patient, laid on his back, has the limb placed over the inclined boards at an angle corresponding with an easy and relaxed flexion. Cushions are placed beneath to obviate undue pressure, and splints secured to the limb to afford lateral support. The weight of the body hanging by and operating upon the superior fragment, naturally draws this from the inferior fragment, and thereby effects *counter-extension*, while the inferior fragment, supported and fixed by the angle of union of the inclined boards, which operate upon the ham of the patient, maintains permanent *extension*. There can be no question that many of the objections to the semiflexed position, as practised by Pott, and followed by the majority of English practitioners, are obviated by this simple and ingenious contrivance; and were I disposed to select that position as more favourable than the extended one, I should certainly to this form of apparatus give a decided preference; but there are objections, I apprehend, even to this, ingenious as it is, which will prevent it from ever coming into general use. Let any one, for the sake of experiment, place beneath his own sound thigh and leg the machine of James or Bell, so as to have the leg secured on one side, the thigh on the other, and the body suspended and supported by the thigh. He will then find, be the cushions ever so soft, that the position is by no means so comfortable as he might have been led to imagine; that the calf of the leg must be firmly and painfully pressed against the flat surface of the inclined boards, that the ham sustains not only the whole weight of the thigh, but that portion of the body elevated above the plane on which it would naturally rest, and under circumstances, too, most disadvantageous; being fixed upon a sharp angle, formed by the union of the two inclined boards, and leaving a surface too inconsiderable to form any other than the most painful support. If he finds this attitude painful, and with difficulty borne, for any length of time, by a sound limb, how injurious will he conclude must be the effect produced upon

* See Cooper and Travers' Surgical Essays.

† Operative Surgery, vol. ii.

an inflamed and broken thigh, when similarly circumstanced? That extension and counter-extension can be produced by this apparatus, and yet the semiflexed position be preserved, there cannot be the slightest doubt. But it is extremely doubtful whether the patient can sustain the torture necessary to carry the operation into full effect. Cannot a moderate degree of extension and counter-extension, it may be asked, be kept up? To this it may be answered, take off from the ham the degree of pressure necessary to relieve the patient, the body sinks and is supported by the bed, counter-extension is therefore removed, extension is destroyed, and how then does your method differ from that of Pott, except in the patient being placed on his back, and a partial support being given to his limb? But granting these objections to be unfounded, would the weight of the body be always sufficient to effect counter-extension and prevent the bones from overlapping? On the other hand, would it not sometimes happen, in large and heavy men, that from too much force being exerted upon the superior fragment, by the weight of the body, inordinate irritation would ensue? Again—how are we to prevent the rotation of the pelvis, when one limb is suspended on a frame and the other extended and left at liberty? But, in answer to all this, it may perhaps be said, that the twenty years' experience of Mr. Cooper, and the authority of Mr. Bell, are sufficient to justify the practice. To this it may be necessary to reply, that, with unbounded respect for the professional talents of these gentlemen, it is well known that the English surgeons, from time immemorial, have been grossly deficient in the application of bandages, and the management of fractures and dislocations. This does not rest upon bare assertion; many of their best writers acknowledge and lament the fact. Let any student even now walk the rounds of the Edinburgh Infirmary, or the London Hospitals, and he will there see broken legs crooked and deformed, and without splints, and broken thighs without support, withered and shortened, and almost useless to the patient. The fault then does not rest with the individuals of the profession, but with their country. "All these changes," says Roux,* "introduced into the art of treating fractures, which appear to us so many useful innovations, have not been considered as such by the English surgeons; and for having rejected them, or for not having adopted them, they have remained behind us in this

* Narrative of a Journey to London.

important part of surgical treatment.”—“The English surgeons very seldom renew the application in the treatment of fractures, and they sometimes scarcely examine the limb at all, during all the time necessary for the formation of the callus. But it must result from this negligence, that the limb is not well kept in its position: the broken parts must, in some measure, be moveable, one on the other, and for that very reason be disposed to yield to all the causes which may displace them. I believe, in consequence of these circumstances, that the English surgeons can very rarely obtain the cure of fractures of the lower limbs, with the least possible deformity.”—“Too much attention can scarcely be paid,” says Dr. Hennen, (one of the most enlightened surgeons from the days of Hunter to the present time,) “to the application of the roller; yet candour compels me to say, that foreigners of almost all countries excel us in this fundamental part of our art. Our young surgeons may study, philosophize, and reason well; but neither books, reflection, nor arguments, will teach the application of a bandage, without repeated practice.”*

It will naturally be inquired, then, what means I propose to substitute for those I have unequivocally condemned, and upon what principles I imagine fractures of the thigh should be treated? To this I reply, that the indications pointed out by Desault and acknowledged by most of the French surgeons, I consider the most appropriate, and only condemn the particular mode of carrying them into effect: that to accomplish this, other means may be devised, free from many of the inconveniences already complained of, and equally effectual in keeping up *extension* and *counter-extension*.

These measures may be fulfilled in the following way. Instead of exerting force sufficient to counteract the contractions of the muscles and lengthen the limb by the use of counter-extending bands, placed upon the perineum of the injured thigh, the *sound* limb should be extended, and made to serve as a *splint* to the broken limb—the foot of the latter being drawn down and secured on a level with the former. But these, it will immediately be said, are the principles of *Brunninghausen*; principles long ago found inefficient, and justly abandoned. Before this be answered, let us inquire into the particular method employed by

* Principles of Military Surgery.

that surgeon, and then judge whether the defects proceed from the principle or from the apparatus itself. Brunninghausen, it is true, laid the patient on his back, kept both limbs in the extended position, and fastened the broken one to the sound by a sort of stirrup, so as to keep both feet on a line, and thus apparently to preserve the natural length of the limbs. But in such cases what is to prevent the patient's body and pelvis from inclining to the side of the broken thigh; and if this inclination take place, will not the superior fragment of the os femoris descend and overlap the inferior fragment? Experience has sufficiently demonstrated that such an effect is really produced, and that therefore, although the sound limb is kept fully extended, and the two feet and knees precisely on a level, yet the broken thigh may be shortened to the extent of two or three inches. On this account, no doubt, the method of Brunninghausen was laid aside, and no attempt that I know of, made to revive his principle until a short time past. This was brought forward by *Hagedorn*, an eminent continental surgeon, the original account of whose apparatus I have not seen, and shall therefore furnish a description of it from the *second* volume of the "*First lines of the Practice of Surgery*," by *Mr. Samuel Cooper*; a work published in England in 1820.

"Perhaps the most simple and effectual apparatus," says Cooper, "ever invented for fractures of the neck of the thigh bone, is that suggested by Hagedorn. His opinion is, that every apparatus for these cases should be calculated to fulfil the following indications. 1st. It should keep the leg duly extended, and at the same time prevent the foot from being turned outwards. 2d. As all pressure on the muscles of the thigh has a tendency to make them contract, the extension is more effectual when applied not to the thigh, but to the lower part of the limb. 3d. The apparatus must be made as little irksome to the patient as possible. 4th. The patient should not have it in his power to interfere with the extension and reduction. 5th. The apparatus should admit of the employment of fomentations or other applications."

"I believe a reference to plate the 18th, will convey an adequate idea of Hagedorn's original and ingenious apparatus for the treatment of a fracture of the neck of the thigh bone. The invention appears to me both more simple and more likely to answer every purpose, with less risk of failure, and less incon-

venience to the patient, than either the contrivance of Boyer, or that of Desault."

This apparatus, then, as described and figured by Cooper, consists, 1st, of a splint, which for an adult must be between three and four feet long, five inches broad at its upper end, and about two broad at its lower end. On its inside it is excavated from its highest part down to a little below the calf where the concavity ceases, in order to afford strength to the inferior end; 2dly, of a foot-board of considerable thickness, pierced with numerous slits, and large enough for both feet to rest against; 3dly, of a long pad, intended to be placed between the splint and the outside of the limb; 4thly, of leather contrivances, somewhat like gaiters, designed to connect the feet securely with the foot-board. Each of these leather bandages has four straps, two of which are conveyed on each side of the foot through two of the holes in the foot-board, and fastened underneath it. The leather of which these pieces of the apparatus are made, should be rather stiff, and well quilted within, or lined with very soft materials. In front, each of these foot and ankle pieces admits of being laced, so as accurately to fit the part; 5thly, of a broad linen band, to be applied to the foot in order to keep it inclined inwards. Between this band and the instep, some soft materials, or a pad, should be placed. It has four tails, two of which on each side pass through the anterior rows of holes in the foot-board, and are tied underneath it; 6thly, of a soft linen band, the use of which is to fasten the splint to the pelvis. Lastly, it is to be understood that between the soles of the feet and the upper surface of the foot-board, soft pads are to be placed.

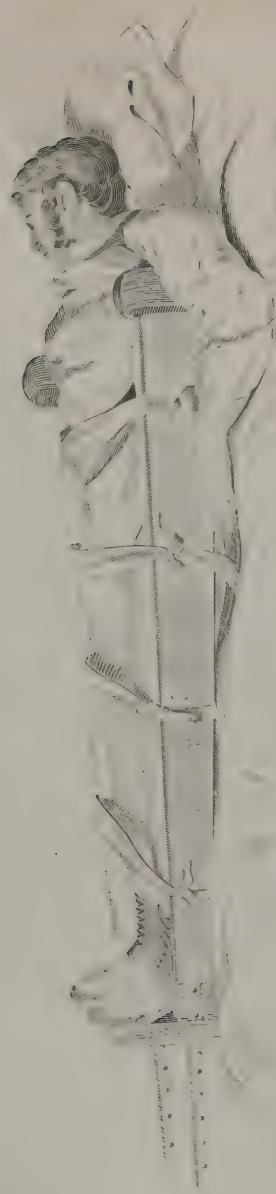
"Hagedorn gives the following directions respecting the mode of putting on the above apparatus. Previously to the reduction, the splint is to be fastened upon the *sound* limb, and the two ankle leathers applied. After the reduction, two assistants are to keep the limb extended, while the surgeon screws on the foot-board, and places under the sole of the sound limb the pad, or little cushion, which becomes secured in this situation, as soon as the four tails of the ankle leather have been drawn through the first and second rows of slits in the foot-board, and tied underneath it in a couple of surgeon's knots. The sound limb is now to be approximated to the broken one; both are to be put into the most natural situation and position; the other cushion is to be interposed betwixt the foot-board and the sole of the frac-

tured limb; the four tails of the ankle leather on the injured member are to be drawn through the first and second rows of slits in the foot-board, and tied; the foot-board itself is now to be screwed to the splint as firmly as possible, and a little wedge, not mentioned in the previous account, pushed into the space between the two screws and the foot-board. Lastly, in order to prevent the toes from being turned outwards, the band is applied across the upper part of the foot, and its tails fastened under the foot-board."

"Nothing can be more simple and better qualified than this apparatus for maintaining the extension and holding the foot in any position which may be deemed best, and this without hurting any part by the pressure employed, or causing any kind of serious annoyance to the patient."

"As soon as Hagedorn's simple but efficient apparatus," continues Mr. Cooper, "is at all known in England, I have no doubt that it will here be considered by every impartial judge, as the very best contrivance, not only for the treatment of fractures of the neck of the femur, but also for that of all oblique and very troublesome fractures of the same bone, especially, as in these cases, it would not preclude the application of splints to the injured thigh itself."

It happened about the time I first read the account of Hagedorn's apparatus, as detailed by Cooper, I attended,—with the late Dr. Dewees,—a gentleman of this city, who, in walking through an entry in the dark, fell and fractured the right femur obliquely, about its middle, and also the left humerus, in a similar manner, just below its neck. The apparatus of Desault was applied, and continued for two or three weeks, but owing to the obesity of the patient, it was found quite impossible to keep up extension and counter-extension sufficient to prevent the overlapping of the bones, and shortening of the limb: besides this, ulceration of the perineum and ankle, from the extending and counter-extending bands, notwithstanding every precaution, soon took place to such an extent, as to oblige us to remove all pressure from the parts, and consequently to render the apparatus inoperative. Under such circumstances I determined to try the method of Hagedorn. I soon found, however, that simple and ingenious as it was, and calculated to effect extension and counter-extension to a much greater degree than that of Desault, that it was still imperfect, but susceptible of such changes as would



make it a most valuable acquisition. In particular, I found, owing to there being but one splint, and that extending a short distance only above the hip of the sound side, that the injured thigh of the patient was left without support, and no resistance opposed to his natural efforts to incline his shoulder, body, and pelvis to the affected side, and consequently, although the inferior fragment retained its position, from the foot being secured on a level with the sound foot, and could not therefore, ascend, yet the *superior* fragment carried down by the weight of the body, and by the inclined pelvis, passed the inferior fragment and shortened the limb. It then occurred to me, if I construct two splints, each padded or stuffed like the head of a crutch, and long enough to reach from the armpit to the foot, and secure these by circular bandages around the body and limbs, and by a foot-board, the necessary support must be given, the pelvis cannot incline, and the broken limb must remain of its natural length. The experiment was tried, and with the happiest effect; notwithstanding the splint could not be carried, owing to the broken arm, as high as could have been wished. Convinced of the utility, then, of the principles, originally suggested by Brunninghausen, and of the efficacy of the particular apparatus I have contrived, as an improvement on that of Hagedorn, I submit a detailed account of its construction, and mode of application.

Two splints, half an inch thick, formed at the upper extremities like the head of a crutch, five inches wide, immediately below this head, five feet and a half in length and tapering towards the lower end, which is about two inches wide, constitute a sort of enclosure for the body and limbs, from the armpits beyond the feet. The lower end of each splint, to the extent of a foot, is straight, and has six or eight holes, at equal distances, large enough to receive a stout peg, intended to secure the foot-board. Shoulders, also, are made in the splint, just above the upper peg hole, for the purpose of preventing the foot-board from ascending. The foot-board itself is made of seasoned tough wood, is an inch thick, about twelve inches long and nine high. At different distances in it, there are three rows of slits, half an inch wide and an inch and a half long, intended for the gaiter straps or bandages which secure the feet to the board. Two other slits or mortises, of the same kind, receive the lower ends of the splints, making in all eleven perforations through the foot-board.

the gaiters are made of soft leather, lined with buckskin, or of strong linen, well quilted on the inner surface; are laced to the leg above the ankle by a cord, and have four straps to each, two near the instep, and two near the heel, sufficiently long to pass through the foot-board and admit of being tied on its back part.

Antecedent to the adjustment of the limb, and the application of the splints, a bedstead should be selected with a board bottom, and over this be placed a thick and firm mattress. If a feather bed be employed, it will be quite impossible to prevent deformity and inconveniences, however well contrived the apparatus may be. This is a point, therefore, which should always be insisted on by the surgeon, and if no mattress be at hand, blankets or quilts must be substituted, and laid over the bedstead or floor. The patient is now placed on the mattress, his clothes being previously stripped off, or cut away, as occasion may require, his body kept perfectly straight, and both limbs placed in the splints. Extension and counter-extension being made, and the ends of the bones coaptated, the splints previously covered by cushions, which are placed on the inner sides, and serve to take off any unpleasant pressure, are next brought closely in contact with the body and limbs. The surgeon then fixes the gaiters to the ankle, and fastens the foot-board to the splints. The feet, having two small cushions beneath them to rest on, are next secured to the foot-board by passing the straps through the holes, and tying them on the outside. It only remains to secure the splints to the body by four or five pieces of roller.

As all patients, with fractured thighs, experience more or less inconvenience from the difficulty of having a passage, and as this difficulty will exist with any apparatus, however constructed, it becomes very desirable to obviate it as much as possible by employing such means as are the most simple, and at the same time most effectual. The ingenious contrivance of Mr. Henry Earle, for suspending the patient, temporarily, on a strong canvass or sacking-bottom, stretched upon a frame, and raised by pulleys or a jack, however well adapted to an hospital or any large establishment, cannot, from its complex and expensive structure, be introduced into private practice, even in a large city, much less in country places. Fortunately, however, every possible advantage may be derived by using Mr. Earle's principle, together with the most simple but effectual part of his machine. For several years past, I have used a common frame,

seven feet long and three feet wide, upon which is tacked a sacking-bottom, having a hole in its centre about the size of the crown of a hat. The sacking-bottom is supported by girths passed beneath it and secured to the frame. As this simple apparatus can be adapted to any common bedstead, it may be kept constantly on hand by the surgeon, or manufactured at a few minutes' notice, if required, by the most common mechanic in any country place. When prepared it will be only necessary to lay the frame over the mattress, place the dressings on the sacking-bottom, (previously covered by a sheet with a hole in it corresponding to the one in the sacking-bottom) and the patient on the dressings, taking care that his buttocks be exactly adapted to the opening. Upon this very simple contrivance, the patient will lie with as much comfort as on the mattress itself, and whenever he desires to have a stool, it will only be necessary for two assistants, one at each end of the bed, to raise the frame six or eight inches from the mattress, and support it in this situation by a small block, placed at each corner of the frame, or by a moveable leg or foot attached to the frame. As I have employed this machine upon several occasions, I can speak with confidence of its efficacy, and can recommend it as equal, if not superior, to the original apparatus itself, which I have frequently seen in operation in the European and American hospitals. But whether this modification of Earle's bedstead be employed or not, I have ascertained to my satisfaction, that the draw-sheet, or dish, or pewter pan, articles in common use, in cases of fractured thigh, can with greater facility be employed when the patient's limbs and body are secured by the plan I have ventured to propose, than by any other mode. Indeed, so firmly are the limbs supported against each other, and so completely is the body fixed, that the whole may be said to constitute but one piece, and the patient can be turned or raised, and the pan slipped beneath him, without, in the slightest degree, disturbing the fragments of bone.

It may be well, in the next place, to anticipate such objections as may possibly be brought against the principles and practice I have endeavoured to establish. It will be said, perhaps, that the extended position, above all others, is the most painful and inconvenient to the patient; that spasmodic affections are very apt to occur, particularly upon every attempt of the patient to procure sleep;—that the confinement of one limb, as usually practised, is irksome enough,—that the confinement of both, and

of the body also, must be, if not insupportable, painful in the extreme; that the counter-extension, which is exerted entirely on the *acetabulum* and thigh of the sound side, will cause the limb to swell, or to become so much fatigued as to produce great distress;—that the gaiters confining the feet to the board, will cause ulceration of the ankles;—that both limbs, from being kept so long in the extended position, will become stiff or anchylosed;—that the inclination of the body and pelvis to the affected side cannot be prevented, by the lodgement of the crutch-like end of the splint in the armpit: for the scapula is a moveable point—being connected to the body chiefly by muscles, which yield to any impulse communicated to them, and that, therefore, the superior fragment of bone cannot be prevented from descending and riding over the inferior fragment; that in cases where both thighs are fractured, the principle upon which the apparatus acts, must be destroyed, and consequently the practice, in such cases, totally inadmissible.

Let us see how far these objections can bear examination. That the extended position is more painful for the first few hours, than the semiflexed one, may, perhaps, be admitted; but it has been proved, beyond all doubt, by Desault, Boyer, Richerand, Roux, and many other distinguished French and Continental surgeons, that the inconvenience is temporary only, that the muscles soon become accustomed to their position and cease to afford uneasiness; that on the contrary, in the semiflexed position, however comfortable the patient may feel for a short time after the accident, yet he soon becomes tired, and would give the world to be permitted to extend the limb.

With regard to the second objection—that spasmodic affections follow the extended more than any other position, it may be remarked, that this is by no means the case, that startings or involuntary twitchings annoy the patient exceedingly, after *all* fractures of the limbs, be the position what it may, especially upon the patient's falling into a doze, from which he is often roused by sudden and violent jerking, and sometimes by a movement of the broken ends; but admitting these startings to accompany the extended more than any other posture, should this be considered a serious objection, when we find it so easy to subdue them by appropriate remedies, such as opium, blood-letting, low diet, topical applications?

As respects the third objection, that the confinement of one limb is bad enough, without the confinement of both, it may be

asked, if the limb were extended and merely enclosed in Desault's or Boyer's apparatus, divested of their extending and counter-extending bands, would the mere posture and confinement be sufficient materially to incommode the patient? On the contrary, has it not been already shown, and even acknowledged by Desault himself, that the chief inconvenience and distress proceeds from the pressure of these bands and the consequent ulceration? If position itself, therefore, be attended with no unpleasant consequence, certainly the additional confinement of the *sound* limb can put the patient to no inconvenience, especially as the use he could make of it, when stretched upon his back and unable to rise, would be so very limited as to contribute*but in the slightest degree to his comfort. Again, the patient is necessarily confined to his back, whether he use the apparatus of Desault or any other. What difference, therefore, can it make to him, whether the splints extend to the armpits or not, or whether the body be kept perfectly straight, or be permitted to deviate to the right or to the left? If the system of Desault be rigidly enforced, or if the splint, as advised by Dr. Physick, be carried to the axilla and there secured, can the patient then raise himself in bed, or can he relieve himself by alternately inclining to either side? Certainly not; for in either case he is as completely fettered as if lashed to a post. If these views be correct, unquestionably no disadvantage can arise from an *additional* splint, which does not encumber the patient, but only serves to give him support.

The fourth objection relates to counter-extension, sustained by the acetabulum and head of the thigh bone of the sound side. Admitting this to produce some uneasiness to the patient, is it not better that it should be borne by a limb uninjured, free from inflammation and devoid of pain, than that the same force should be sustained by a limb acutely sensible, and greatly swollen? But is much force really exerted? Does the patient actually complain of the fatigue and irritation? This I can only answer by stating that in the cases in which I have employed the mode I have advised, no such distress has been occasioned. Indeed, does it not seem rational that the acetabulum, and head of the thigh bone, in their natural state, accustomed as they are to bear at least one half of the weight of the superincumbent parts, should be fully able to support and counteract all the efforts of the muscles of a broken thigh, and that too without sustaining the slightest inconvenience?

The fifth objection—that the gaiters will produce ulceration of the ankles, may be answered by stating, that if so, we are no worse off than if we employed the apparatus of Desault; for his extending band being a single handkerchief, or piece of cotton or linen, will become twisted, and produce more irritation than a band well quilted, and applied to a broad surface.

With regard to the stiffness, which follows from a fractured limb, this will be acknowledged to be of little consequence; for mobility is soon restored upon the patient being able to walk; and even if it were of consequence, it cannot be prevented, and is equally liable to happen in all cases, and in every position that could be devised; and if ankylosis were to follow, which is extremely rare, certainly every one must allow, that it would be infinitely better, in fractures of the lower extremities, to happen in the extended than in the semiflexed position. In the former case, the limb would at least be preserved of its natural length; in the latter it would be shortened, and although the patient might possibly in both instances be lame, yet he would be less so with the limb straight, than crooked.

That the scapula is, in some measure, a moveable point, cannot be denied; but it must be admitted, at the same time, that its muscles are numerous and powerful, and as such, would be capable of resisting any common force set against them, especially, as by such application, they would be stimulated to resistance. Surely if they are sufficiently strong to support in the erect posture the weight of a very heavy man, by crutches, without the scapulæ being much raised, they will at least serve, and that too without an effort, to sustain the body in a recumbent position, and prevent a descent sufficient to incline the pelvis, or enable the superior fragment to ride upon the inferior. But the fact is, that the arm and scapula do not move so readily as some imagine; the clavicle being attached to the sternum, gives very considerable support to the scapula and arm, independently of the resistance afforded by the muscles themselves. It must be recollected, however, that *counter-extension* is not intended to be made from the *armpits*, but from the *acetabulum* of the sound side, and that, therefore, any objections on the score of mobility of the scapula must vanish in an instant.

The only case in which I have supposed any difficulty might arise, is that of fracture of *both* thighs at the same time; yet even in that case I have always felt persuaded that the apparatus might

be so modified as to answer the purpose. The following case, reported to me by the late Dr. Groome, of Maryland, will show how much may be done under the circumstances mentioned.

“On the fourth of March, 1830,” says Dr. Groome, “I was sent for to visit Michael Groff, the son of a respectable farmer in the neighbourhood. I found, on my arrival at the house, that the young man had been run over by a wagon, and had *both* his thighs broken—the left in two places, near the middle, and within an inch of the condyles,—the right thigh was fractured about the middle of the bone. Both the left were transverse, the soft parts bruised. The right fracture was oblique, the lower piece of bone being considerably drawn up on the upper portion of the bone. As soon as a straw bed could be got in readiness with a hole left in it to pass his fæces, I placed him upon it, and applied your apparatus, consisting of two long splints, extending from the axilla beyond the feet, with a cross-bar. Extension was effected by handkerchiefs tied round the ankles, and confined to the foot-board. Counter-extension, (there being no sound limb to serve as a splint) could not be effected by the acetabulum of the sound side, as in a fracture of one thigh only, was kept up by means of two handkerchiefs carried along the perineum over the hip of each side, and fastened in holes made in the splints about midway between the spine of the ilium and axilla. The splints were padded to prevent excoriation—no other dressings were made use of, and in less than six weeks the splints were removed. During harvest the young man was able to work out in the field as usual. No deformity or lameness now exists, and the strength of the limbs appears to be completely established again.

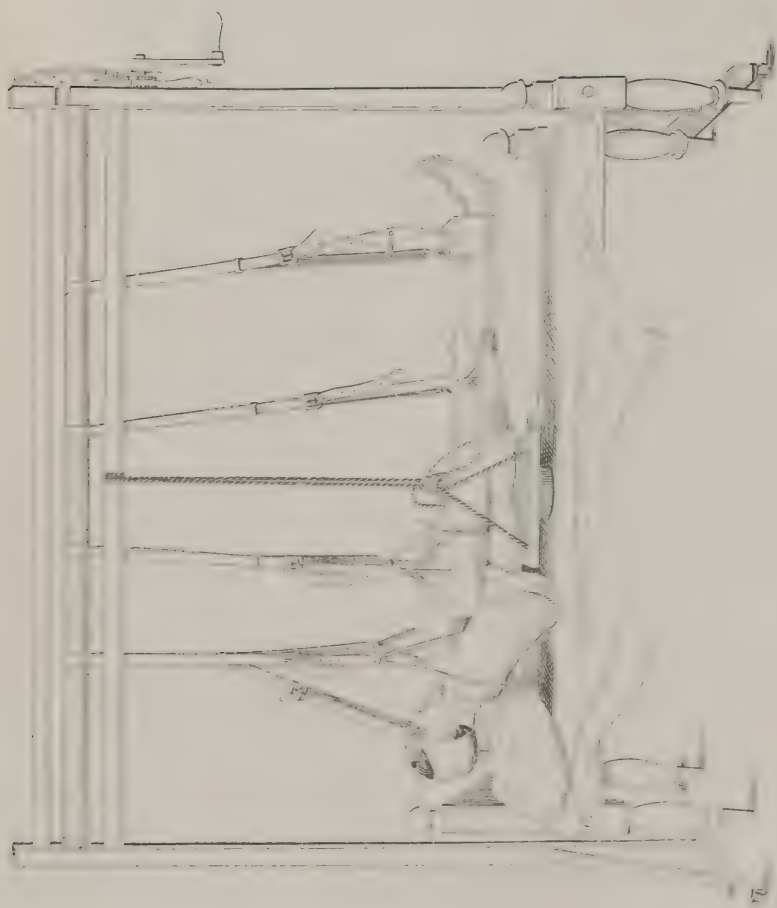
“It is worthy to be noticed, that during the whole of his confinement the patient did not suffer an hour’s pain, or lose a minute’s sleep. To what can this absence of pain be attributed but to the want of bandages? Had I bandaged the limbs according to the usual mode of treatment, inflammation, swelling, and pain must inevitably have ensued.”

Several years have now elapsed since I first used Hagedorn’s apparatus modified in the manner I have described, both in hospital and in private practice, and I confidently state its superiority over every other I have employed or seen applied by practitioners; numerous letters have, also, reached me from distant places, detailing cases successfully treated by it. The late

Dr. Faures, of this city, succeeded in restoring to its original length, by means of it, a limb shortened three inches, and after it had remained three weeks in the splints of Desault. Cures have, also, been made in the most satisfactory manner by Drs. Lott, of Jersey, and Cocke, of Virginia, and Pollock, of Pennsylvania. Three similar cases have been reported to me by Dr. Crisp, of West Tennessee. Dr. Brown, an accomplished physician of Fredericksburg, Virginia, effected in his own person a very perfect cure of an oblique fracture of the thigh by the same means. The late Dr. Corson, of New Hope, in this State, informed me that in a very difficult case of fractured thigh, attended with great deformity and shortening of the limb, he succeeded in producing a complete cure by the same apparatus. Dr. Thomas, of North Carolina, has reported to me the following case.

"A boy, the property of M. D., aged about fourteen years, in driving a loaded wagon, was thrown from his horse and one or two of the wheels passing over his thigh, fractured it near the middle. Dr. Tuck, an eminent practitioner near Halifax Court-House, Virginia, was immediately called and applied the apparatus of Desault, by which a cure was effected in seven weeks. Mr. D. then sent for his boy and conveyed him home, a distance of forty miles. The night after his arrival, the boy, while standing, turned his body suddenly round, and again fractured his thigh. Drs. Thomas and Garland were then called in, and applied Dr. Gibson's apparatus, and in seven weeks a perfect cure was effected, without any deformity whatever. The boy stated that he did not experience half so much inconvenience from this as from Desault's splint." Other similar cases might be subjoined, but the apparatus has now been so frequently employed throughout the United States, as to render, I conceive, further details of the kind unnecessary.

It has always been a desideratum with surgeons, in the management of fractured thigh, to enable the patient, by means of some mechanical apparatus, to evacuate the bowels, without risk of deranging the fragments of bone. Several ingenious contrivances of the kind, as already mentioned in the preceding pages, have been in use for the last twenty or thirty years, though the preference has generally been given in Europe and in this country to *Earle's Bed*. To this, however, and to most others, there are objections, chiefly on account of their complicated and expensive nature, and the necessity the patient is under of *lying*



constantly on the sacking-bottom. To obviate these inconveniences, Mr. Jenks, of Providence, Rhode Island,—a thoroughbred Yankee mechanic, who was so unfortunate, a few years ago, as to meet with a complicated fracture of the thigh, and some other bones in his own person,—has contrived an apparatus simple in the extreme, and so effectual as to remove, I conceive, every possible difficulty.

The machine is composed of two upright posts about six feet high, supported each by a pedestal—of two horizontal bars, at the top, somewhat longer than a common bedstead—of a windlass of the same length placed six inches below the upper bar—of a cog-wheel and handle—of linen belts, from six to twelve inches wide—of straps secured at one end of the windlass, and at the other having hooks attached to corresponding eyes in the linen belts—of a head piece made of netting—of a piece of sheet-iron twelve inches long, and hollowed out to fit and surround the thigh—of a bed-pan, box, and cushion to support it, and of some other minor parts. The patient lying on his mattress, and his limb surrounded by the apparatus of Desault, Hagedorn, or any other that may be preferred, the surgeon, or any common attendant, will only find it requisite to pass the linen belts beneath his body, [attaching them to the hooks on the ends of the straps, and adjusting the whole at the proper distance and length, so as to balance the body exactly,] and raise it from the mattress by turning the handle of the windlass. While the patient is thus suspended, the bed can be made up, and the fæces and urine evacuated. To lower the patient again, and replace him on the mattress, the windlass must be reversed. The linen belts may then be removed, and the body brought in contact with the sheet. See Plate XIII.*

There is still another mode of treating a fractured thigh which I have occasionally found useful, and adapted to particular patients and peculiar kinds of injury—by the single inclined plane. Finding the patients sometimes complain of the irksomeness of the extended position, as kept up by Desault's apparatus as well

* Most of the foregoing remarks, in relation to Hagedorn's apparatus, and the modification of it, were published by myself, several years ago, in the fifth volume of the Philadelphia Journal of Medical Sciences. They have now been transferred to these pages, with more or less alteration, in hopes that the importance of the subject will form a sufficient apology for circulating them more extensively than they could have been through their original medium.

as Hagedorn's, and knowing how many people in health are in the habit of throwing themselves back on one or both hind-legs of a chair, and of elevating their lower extremities as high as they can conveniently get them, in order to relax the muscles and obtain ease, it occurred to me several years ago that by imitating this ungraceful act of self-indulgence, most of the indications I considered essential to the preservation of the limb in fractured thigh might be fulfilled in the following manner:—1st, to elevate each extremity upon an inclined plane extending from the ischium to the heel; 2dly, to secure each foot to a foot-board by gaiters; and 3dly, to permit the patient's body to rest, unincumbered, upon a mattress and pillows. With this view I contrived the following machine; consisting of a board sixteen inches wide, two feet four inches high, placed vertically, with six mortises near its upper extremity; of another board of similar breadth and length, placed horizontally; of a third, three feet in length, and extending from the extremity of the horizontal piece, to within ten inches of the top of the upright one, so as to form an *inclined plane*. The whole being joined together, present the figure of an unequal triangle. At the lower extremity of the inclined plane, an opening is left six inches wide, and eight long, with a corresponding door, intended to convey a vessel beneath the patient to receive the *fæces* or urine. Opposite this there is another and a larger opening, of a circular form, in the horizontal board to afford ample room for the pan to rest. There are, likewise, two mattresses, two foot-cushions, and a pair of gaiters. The larger mattress is of the exact breadth and length of the inclined board; is two inches and a half thick, is fastened to its surface by straps secured on its edges, and is cut out at its lower part opposite to the hole in the board. The smaller mattress forms a kind of cushion, and is exactly adapted to the opening in the large one, being intended to fill it at all times, except when the patient is at stool. The foot-cushions are made of the same materials as the mattress, being stuffed and quilted; are three inches broad, nine long, and one thick; they are placed vertically between the mortises of the foot-board and secured to it by tacks, their lower end resting on the mattress. The gaiters are made of cloth lined with soft buckskin, and resemble those commonly worn by foot soldiers. They have four straps about twelve inches long attached to each, two near the heel, and two near the instep. Lastly, there are two round pins six inches long, passed



through holes in the inclined board near its lower end. This constitutes the whole apparatus, and will be found suitable in its dimensions for a patient from five feet six inches to six feet in height. If necessary, the machine can be so contrived as to increase or diminish the angle, and thus be adapted to persons of different size. See Plate XIV.

Every thing being adjusted, the patient is laid on a firm mattress placed on a bedstead, with a broad bottom; the triangular frame, with its appurtenances, is then to rest on the mattress, near its lower end; the extremities of the patient are next elevated, and in this position are gently extended upon the inclined plane—covered by its mattress—the feet are brought in contact with the foot-cushions and are secured to them by the gaiters, previously laced to the ankles, the straps being passed through the mortises and tied on the back of the upright board. The fractured limb being straightened and laid carefully alongside of the sound limb, the two pins are placed in the inclined board and serve the purpose of preventing the thighs from slipping out of their position. The patient's hips and body rest upon the common mattress covering the bedstead; his head and shoulders are elevated to a convenient height, by pillows or a bed chair. To enable him to have a stool, or pass urine, it will only be necessary to withdraw the small bolster from the opening, by passing the hand under the inclined board. The pan is then readily introduced, and as easily withdrawn, without giving rise to any movement on the part of the patient. After this the bolster is replaced and confined in its situation by the door and a small wooden slide or strap. It will be seen in a moment how this machine operates. The two feet, by means of the gaiters, are placed on a level, and there retained; the lower fragment of bone cannot, therefore, be drawn upon the posterior surface of the upper fragment, as usually happens in oblique fractures, but must be kept in its natural situation; the weight of the body hanging by, and operating upon, the superior fragment, draws it downwards, removes it from the inferior fragment so as to prevent overlapping, and thereby preserves the whole limb of its natural length—extension being made upon the ankles, counter-extension by the weight of the body.

Perhaps it may be asked, how does this apparatus differ from that of White, Bell, or Cooper? I answer, in every possible

way—in principle as well as construction. In one the limb is placed in the *extended* position, in the other in the flexed. To keep it flexed a triangular box is used, the thigh rests upon one side of it, the leg upon the other, where the calf is painfully pressed, while the angle of union of the inclined boards exerts intolerable force upon the ham. The foot, also, hangs loose and vacillating, and the diseased thigh being mounted over the frame while the sound one is stretched upon the bed, rotation of the pelvis and deformity is the natural consequence. Besides, the patient's leg, from hanging in a dependent posture, becomes swelled and œdematous, and other inconveniences arise, which I have formerly pointed out. But, on the other hand, observe the advantages resulting from the *extension* of the limb. The feet are kept on a level, by which extension is effected—*counter-extension* is maintained by the weight of the body; therefore no shortening can take place. Indeed in this particular contrivance, there is a combination of flexion and extension; the thighs are bent upon the pelvis, by which the muscles are relaxed, and the legs extended upon the thighs. The very principles, then, of Pott are in a great measure, preserved without the inconveniences of their application; and yet extension is produced. Again—the limbs being elevated, the inflammatory symptoms are prevented or subdued by *position*—the blood being drained from the lower extremities and determined to other parts, whereby pain, swelling, and œdema, very common attendants upon fractures, are effectually guarded against.

With respect to the latter circumstance—the removal of inflammation by *position*—I may speak with the utmost confidence. It is now well known, perhaps, throughout the United States, that the late Dr. Physick was able, for a great length of time, by position alone, not only to relieve pain, and remove inflammation, but to effect the most perfect cures after other remedies had failed. The practice originated with him, and he was entitled *exclusively* to the merit of having established it upon the firmest basis. If then it be so beneficial in other diseases, have we not a right to expect a similar result in fractures of the thigh? And if so, is not the position I have advised, independently of other circumstances, the most favourable that could have been selected for particular cases? Are there not, also, other advantages possessed by this apparatus? Is it not equally well adapted to fractures of *both* thighs as of one only? Can it not be em-

ployed with similar benefit in fractures of one or both legs, in fractures of the patella, &c.?

It may be asked, will not the gaiter cause inflammation and ulceration, by its long-continued pressure upon the ankle? I can only say, that, so far as I have tried the experiment, no such inconvenience has followed. The limbs are not supported by the feet alone, or in other words, the patient is not suspended in the air by his *feet*, but a considerable part of the pressure is taken off by the gradual support afforded the thigh and leg by the inclined plane and mattress beneath them. But supposing ulceration to follow, will not the same happen from the extending bands of Desault, Hagedorn, and others? Should it ever occur, however, in the apparatus I have described, I think that an effectual mode might be found to relieve it—by removing the gaiters from the ankles and placing bands around the knees and securing them to the frame beneath, which would serve to keep up extension.

In conclusion I may state, that I have not tried this plan to any extent, because I have had reason, in most instances, to be satisfied with the apparatus of Hagedorn; but in a few cases where the patient appeared to object to the extended position required by Hagedorn and Desault, I have resorted to this mode advantageously. In one case in particular it seemed indispensable—that of a mulatto man in the Philadelphia Hospital, twelve or fifteen years ago, who had complete ankylosis of the knee joint, and the leg bent backwards at a right angle, and who was so unfortunate as to break his thigh. As it was impossible to use either Desault's or Hagedorn's apparatus, my only resource was the double-inclined plane, or the apparatus I have just described. I preferred the latter so modified as to let the leg pass through an opening in the inclined board and make extension from the *knee*, and in this way in a short time produced a cure without shortening of the thigh.

There are several machines and forms of apparatus invented by American surgeons, for fractures of the thigh and leg, all of which are contrived with more or less ingenuity, and are, no doubt, well adapted to the purpose. Among the rest I may mention those of Drs. Hartshorne of this city, Bowen of Cincinnati, and Woolston of Jersey, but have to regret that I have not space enough to give an account of them. I may say the same of the machines of Amesbury of London, and of McIntire and

Greenhow of Newcastle-upon-Tyne, which are well spoken of by my friend Professor Cooper of the London University, in the last edition of his invaluable work—the Dictionary of Surgery.

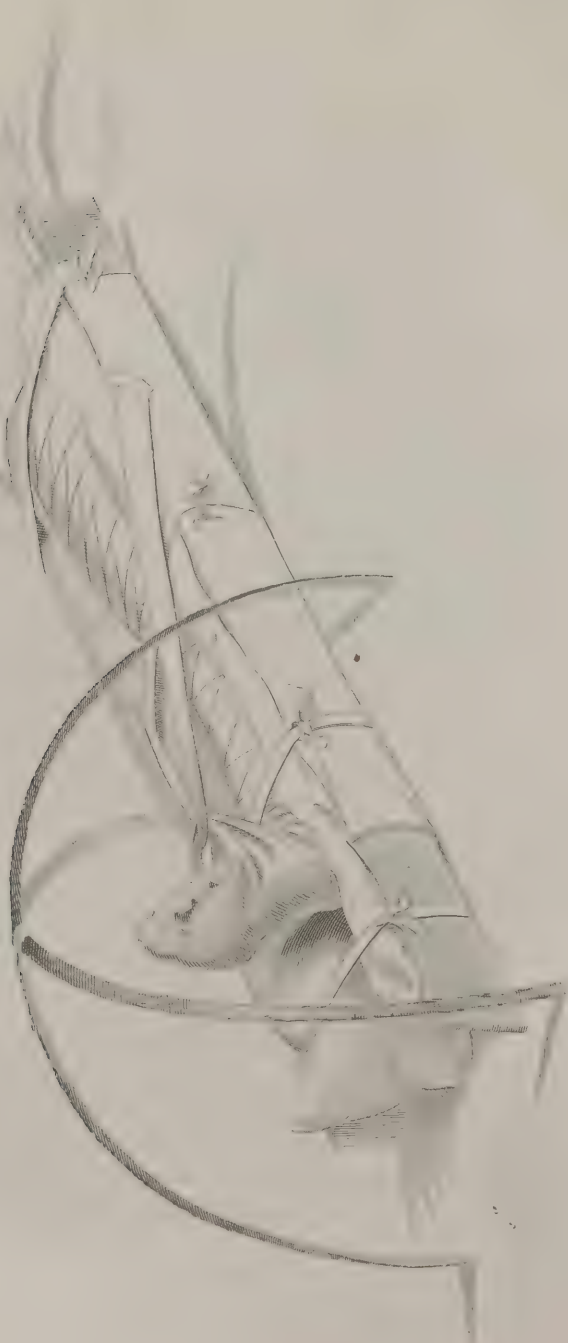
SECTION XIV.

FRACTURE OF THE LEG AND FOOT.

THE bones of the leg are susceptible of every variety of fracture; and may be broken at any place intermediate to the knee and ankle. Oblique and transverse fractures, however, about the middle of the limb, are most common. When both bones are fractured at the same time, there is commonly an angular derangement together with evident crepitation, and by these signs the nature of the disease is rendered very plain. But a longitudinal displacement sometimes occurs, in which case the bones overlap and produce a shortening of the limb. If only one bone be broken, the other serves as a splint, and prevents, in a measure, deformity, though it cannot obviate the *crepitation*, and by this sign the character of the accident is evinced.

Although the fibula is exceedingly weak and slender, and apparently contributes but very little to the strength of the leg, yet when broken near its lower end, deformity and permanent lameness are extremely apt to follow, unless the case be well understood and managed with adroitness. The lower part of the fibula, in fact, forms the external boundary to the ankle joint, and serves mainly to preserve the foot in its natural situation. As soon therefore as fracture of the bone takes place just above the ankle, the lower extremity of it is forced outwards by the abduction of the foot, while its upper portion, or that which is in contact with the upper fragment or shaft of the fibula, is directed inwards in an angular direction. Hence the astragalus may be thrown from the tibia, the foot drawn to the outside of the leg, and great deformity ensue. Fractures of the middle, or of the upper extremity of the fibula, are comparatively unimportant.

The *os calcis*, from its great thickness and strength, is seldom fractured, except by great violence conjoined with inordinate ac-



tion of the extensor muscle. A fall from a height by which the patient lights on his heels, is the most common cause of it. Upon examination, the extremity of the bone will be found separated from its body and drawn upwards on the posterior surface of the leg, where it forms a distinct tumour. By this sign the nature of the case will be clearly manifested.

The remaining bones of the foot may be comminuted by great violence directly applied to them, but are hardly susceptible of any other species of fracture. Like similar injuries of the hand, they are chiefly dangerous from the inflammation that follows.

TREATMENT OF FRACTURE OF THE LEG AND FOOT.

Simple fractures of one or both bones of the leg may all be treated upon the same principle—with the exception of fracture of the fibula immediately above the ankle.

My own plan of managing these accidents is the following. A mattress should first be prepared as directed for fracture of the thigh. Over the sheet which covers it five or six pieces of tape are laid; above the tapes a splint cloth, a yard and a half long and eighteen inches wide; next to the splint cloth a small firm pillow, covered by its case, and on the pillow the bandage of Scultetus, comprising a sufficient number of strips to reach from the ankle to the knee. Four or five assistants then take hold of the patient, and lifting him upon the mattress, place the limb on the pillow in the centre of the dressings. Extension and counter-extension are next made from the foot and knee, the fragments properly replaced, and the bandage of Scultetus applied. Two wooden splints, somewhat longer than the leg, half an inch thick and three inches wide, are then rolled in the splint cloth and folded closely against the pillow, so as to elevate its sides and cause it to fit the limb with the utmost accuracy; after which the tapes are tied over the edges of the splints, and the whole secured. To support the foot and keep it steadily fixed, the centre of a piece of roller about a yard long, should be placed on the sole, the ends crossed on the instep, and pinned above on each side of the splint cloth. Lastly, two segments of a common barrel-hoop are crossed at the centre and tied, and their ends placed upon the mattress over the foot and dressings, to take off the weight of the bed-clothes. See Plate XV.

When the bones pass each other and the limb is shortened, which very seldom occurs, it may become necessary to keep up extension and counter-extension by some apparatus. That employed by Dr. Hutchinson will be found the most convenient. It consists of two firm splints, long enough to extend from the knee several inches beyond the foot. The upper end of each splint has four small holes in it for the passages of tapes, and the lower a mortise, intended to receive a bar eight inches long. The bandage of Scultetus being applied and the leg laid on a pillow, two tapes are placed on each side of the leg, parallel with it, immediately below the knee, and are secured by a roller passed several times around the limb. Through the holes in the splints the ends of the tapes are next passed, and tied on the outside. Around the ankle, in the form of the figure 8, a silk handkerchief is placed, and the ends secured to the bar which is previously passed through the mortises at the lower end of the splint. By the tapes and roller counter-extension is produced, and by the handkerchief extension.

Should fracture of the fibula take place near its lower end, accompanied by distortion of the foot outwards, the method proposed by Dupuytren will be found the most effectual. Two rollers, a cushion or pad, and a splint, constitute the means by which reduction is accomplished and maintained.

The cushion, made of old linen or any similar material, must be two feet six inches long, five inches broad and four thick; the splint two feet, and the rollers each five yards in length. The cushion, formed in the shape of a wedge, is laid along the internal surface of the leg, with its thick end downwards, and should extend from the upper end of the tibia to the ankle. Over the cushion the splint is laid so as to project four or five inches beyond the foot; one of the rollers is then passed around the cushion and splint immediately below the knee, and extended down the leg as far as the ankle. A space of several inches will thus be left between the foot and splint, which must be filled up by drawing the one to the other with the remaining roller, passed over the instep and heel in the form of the figure 8. It must be obvious that in proportion as the lower fragment of the fibula is drawn downwards and inwards along the foot, its upper end must be carried outwards, or recede from the tibia, and resume its natural situation. Dupuytren has the credit of suggesting this mode of treatment; but it was employed by the late Dr.

Physick, many years before the claims of the French professor were made public.

To replace the fractured *os calcis*, the surgeon bends the thigh on the pelvis, and extends the foot on the leg. The superior fragment is then drawn downwards, and by an assistant retained in contact with the inferior, while the surgeon lays one end of a compress or short roller on the instep, carries it over the toes,—which are well covered with charpee, or lint—under the sole of the foot and heel, along the posterior surface of the whole limb, as high as the pelvis, where it is held tense by another assistant. He then takes a common roller eight or ten yards long, and passing it around the foot by two or three circular turns, secures the end of the compress, after which the roller is carried about the *os calcis* and foot several times in form of the figure 8, thence passes up the leg and thigh by reversed and circular turns, and terminates at the hip, where it is fixed to the upper end of the compress. It only remains to preserve the limb in the position first given to it, and this is easily accomplished by placing three or four pillows under the ham, in the form of a double inclined plane. Sometimes it may be necessary to follow Desault's practice, and place a short splint over the instep—to keep the foot extended.



SECTION XV.

COMPOUND FRACTURE.

A wound communicating with the cavity of a broken bone, in which sense the term compound fracture is generally understood, may be produced by external violence, or by the protrusion of the bone itself. In the latter case, the bone is usually broken in a very oblique direction, though it sometimes happens that a very obtuse fragment will penetrate the integuments and produce an extensive wound. The bones are all liable to compound fracture, but the long or cylindrical ones, especially those of the

leg, are most apt to suffer. Unless combined with other injury, the mere protrusion of the bone does not necessarily increase the danger of the case, for it often happens that the wound heals by the first intention immediately after the fragments are replaced. This was called, by Mr. Hunter, a *simple* compound fracture.

A *complicated* fracture is not necessarily accompanied by an external wound or a protruded bone, and in this respect, among others, differs from a compound fracture. An open wound, however, conjoined with a luxation or with a lacerated artery, will generally exasperate all the symptoms, which at any rate are often liable to terminate most unfavourably.

TREATMENT OF COMPOUND FRACTURE.

The treatment of compound fracture must be regulated by the extent of the injury, and by the age, constitution, and habits of the patient. If the external wound is slight and the hemorrhage inconsiderable, it will be sufficient to replace the bones and apply the dressings for simple fracture—merely covering the wound with a piece of lint or adhesive plaster. On the contrary, when the bones have been extensively shattered and their ends project several inches beyond the wound, while the surrounding soft parts are lacerated and mangled, and blood is streaming from the limb, a very different course should be pursued. To replace the bones under these circumstances will sometimes be found very difficult; but the surgeon should always make the attempt before he ventures to dilate the wound or saw off the bones. By well directed and gentle efforts in the way of extension and counter-extension, the fragments may often be restored to their places; if these fail, then the soft parts which appear to bind the bones and prevent them from yielding may be slightly divided, and other trials by extension made. Should every endeavour of the kind prove fruitless, there can be no other resource than to cut off the bone, though it must be obvious that such an operation can very seldom prove necessary, and must always be attended with disadvantage, inasmuch as the limb will probably remain shortened or months elapse before the bone is regenerated. After the bones are replaced, it generally happens that the hemorrhage stops; should the blood, however, continue to flow copiously, it may be necessary to dilate the wound and

search for the vessels, which must be secured by the ligature or compress. Rather than make a very large opening, by dissecting among tendons, fasciæ and nerves, it will sometimes be better to cut upon the *main* artery of the limb and secure it by a single ligature. This will have the effect of diverting the blood from its usual course, of diminishing the impetus of the circulation, and thereby of favouring the disposition to coagulation in the mouths of the wounded vessels. The remark, however, of Professor Cooper should never be forgotten. "If," says he, "we look over the particulars of cases, where operations were practised to secure the anterior or posterior tibial artery, in compound fractures, we shall find that the result has commonly been mortification of the limb, and the patient's death." But it happens, occasionally, that this operation also fails, owing to the blood, by the enlargement of the collateral branches, finding its way circuitously to the original wound. Cases of the kind have been reported by Hodgson and others. Under such circumstances, *compression* in the manner formerly pointed out may, perhaps, be the only remedy.*

Instead of confining the limb by splints and rollers, it should be placed on a pillow and surrounded loosely with the bandage of Scultetus, and every care taken to obviate and remove inflammation. After this has subsided and the wound begun to heal, splints, and the usual dressings may be applied. Months, however, often elapse before a cure is effected; the suppurative stage is kept up, and pieces of bone are constantly working out. These should be removed as soon as detached, and great care taken to keep the part clean and to prevent sinuses from forming. When old, debilitated, and intemperate patients suffer from compound fractures, mortification may ensue. Such patients generally require a nutritive diet, ammonia, bark, wine, fermented liquors, &c.

Complicated fractures not unfrequently terminate in death, or render amputation necessary. Under favourable circumstances the treatment does not differ from that of compound fracture.

* See ante, p. 70.

SECTION XVI.

PSEUDARTHROSIS, OR UNNATURAL JOINT.

WHEN the extremities of a fractured bone, instead of uniting through the medium of callus, remain loose and unconnected, a kind of false articulation is established and the limb rendered nearly useless. This disease may follow a fracture of any bone, though it has been most frequently observed in the humerus. It may arise from premature use of the limb, from the interposition of a tendon, ligament, or muscle, from old age, certain peculiarities of constitution, disease in the osseous system, or from want of proper contact between the fragments. Reunion having been prevented by any of these means, the extremities of the bone generally become smooth and round, and are covered with a cellular or ligamentous substance. Sometimes a ball and socket are formed, and the ends of the bone roll upon each other. Two specimens of the kind are contained in my cabinet.

TREATMENT OF UNNATURAL JOINT.

In old subjects, and in peculiar constitutions, callus is sometimes secreted very slowly, and months elapse before reunion is perfected. Aware of this, the surgeon should never despair of effecting a cure, but continue the dressings so long as any reasonable hope of success remains. Sometimes, however, it may be proper to deviate from this rule and permit the patient to use the limb, even although the fragments should continue moveable—a practice first suggested, I believe, by Mr. Hunter. By adopting this plan, the formation of callus will be promoted and unnatural joint often prevented. Indeed, in the early stage of this disease similar means have occasionally been used with success; at least friction, or rubbing of the fragments upon each other has been found in a few instances to excite ossific action to a sufficient degree to effect a cure. When this does not answer the purpose, other remedies have been employed, such as salivation, irritating injections, warm and stimulating frictions, the actual and potential cauteries, vesications, mineral water

douches, electricity, pressure from leather and other girths, and from metallic bands, the introduction of silver wire into each extremity of the bone, the immoveable apparatus, &c. In cases of long standing, however, there are two modes of procedure—the *removal* of the ends of the bone, or the introduction of a *seton* between them. The former has sometimes succeeded, but is difficult of execution, and liable to be followed by severe symptoms and even death; the latter is extremely simple, and, when well managed, rarely fails.

To the late Dr. Physick is *exclusively* due the merit of having first proposed and executed with success this ingenious operation. Upon my arrival in Edinburgh, in 1806, I communicated to the elder Monro, and afterwards to several distinguished surgeons of London, the result of two or three cases, in which Dr. Physick had introduced the seton with complete success. The only one, however, who seemed to feel an interest in the operation was Sir Charles Bell, to whom, by particular request, I transmitted, upon my return home, in 1810, an account of all the cases in which Dr. Physick had then operated. These were afterwards published in the second edition of his “Operative Surgery,” and in answer to my communication, Sir Charles remarks, “I have been reading your cases of the operation of the seton in artificial joint to my class. I continue to think it one of the most ingenious things in modern surgery. I have a patient who I am in hopes will submit to the operation. He is a captain of an Indiaman. His thigh bone was broken by a spent cannon-ball about eighteen months ago, and has not united.” Upon showing the letter to Dr. Physick, he desired me to say, that he had twice tried the seton in the *thigh*, but without effect, and he was fearful that it would not succeed in any case of the kind. Whether Sir Charles afterwards performed the operation referred to, I have not ascertained; but that Dr. Physick’s apprehension was unfounded, has since been proved by Sir Benjamin Brodie and others who have succeeded upon the thigh as well as other bones. That the seton sometimes fails there can be no doubt, but that it generally succeeds is equally certain.

A case occurred a few years ago at the Philadelphia Hospital, in which a seton was passed, at different times, between the ends of a disunited humerus without effect. Dr. Hewson afterwards cut off the extremities of the bone with a saw, union took place,

and the patient recovered the use of his arm. On the other hand, a case is related by Professor Cooper,* “of a strong robust man, whose chief peculiarity seemed to be his indifference to pain; the ends of his broken humerus were cut down to, turned out and sawn off by Mr. Long, in St. Bartholomew’s Hospital, and the limb was afterwards put in splints, and taken the greatest care of; but no union followed.”

In general, when the seton fails to procure reunion, there is reason to believe that it has not been continued a sufficient length of time. In 1806, I was present at an operation performed by the late Dr. Physick, upon the humerus of a woman residing in Baltimore; for some trivial reason, the physician under whose care the patient was left, removed the seton in two or three weeks, and no benefit of course resulted. Again—within the last ten years, Dr. Physick passed a seton between the ends of a disunited lower jaw, and the patient returned home. In a little time his attending physician became anxious to remove the cord, under an idea that no union would take place; the patient, however, had promised Dr. Physick before his departure, that no one except himself should take it out. It was therefore continued a few weeks longer, and in the mean time perfect bony reunion was established. Sometimes, however, the seton effects its purpose in a very short time. In a case reported to me, in 1828, by Dr. George T. Kennon, a respectable practitioner of Norfolk, Virginia, the cure was accomplished in an uncommonly short period. “I have yet seen no case reported,” says Dr. Kennon, “where the union went on as rapidly as in this case. On the fourteenth day after the seton was passed, the bending of the leg at the fracture was evidently more difficult, and believing that the degree of inflammation already excited was sufficient for the purposes intended, the seton was withdrawn, the leg dressed with splints, and the patient discharged, cured, on the *ninth* week from the operation, and the *seventh* from the removal of the seton. The patient was twenty-five years of age, of fine constitution, and withal obedient to his physicians, during the period of his confinement. The case had been of *fourteen* months’ standing.” I myself have operated in ten or twelve cases with the seton, and have uniformly found it more or less successful.

* See Dictionary of Surgery.

To perform this operation, the surgeon should be provided with a skein of silk, and a long narrow seton needle, either round or flat. The limb should then be extended by assistants, in order to separate the extremities of the bones as much as possible from each other, while the surgeon passes the needle, armed with the silk, through the integuments and muscles, and between the bones, taking care to avoid all the large vessels and nerves. Over each orifice made by the seton is placed a bit of lint and a pledget, and the limb supported by a roller and splints. Four or five, and sometimes twelve months, should elapse before the seton is removed; at the end of which time the fragments will generally be found perfectly consolidated.

The limits of this work will not allow me to enter further into the history, pathology, and treatment of this interesting affection; but I refer, with great pleasure, to a monograph, and the only English one, I believe, extant in which every variety of information will be found; which exhibits an extent of research, coupled with judicious selections and an accuracy and precision of statement, rarely met with—especially among young and unpractised writers. I allude to an *Inaugural Essay** by Dr. Edward Hartshorne of this city—son of one of our most distinguished physicians and surgeons.

With no less pleasure I may also add, that Dr. George Norris, one of the Surgeons of the Pennsylvania Hospital—a gentleman already distinguished for the extent and variety of his surgical attainments, the accuracy of his statements, and the soundness of his judgment—has been devoting himself to the investigation of this subject, with the view to publication; and that much may be expected from one whose cautious circumspection and industry have recently been the means of supplying the profession with practical details and valuable inferences from them, not easily obtained.

On Fractures, consult Desault on Fractures, Luxations, and other Affections of the Bones, translated by Caldwell, 2d edit. 1811; Boyer's Lectures on Diseases of the Bones; Boyer's Treatise on Surgical Diseases, by Stevens, vol. ii.; Dorsey's Elements of Surgery, vol. i. p. 1818, edit. by Randolph; Surgical Essays, by Cooper and Travers; Bell's Operative Surgery, vol. ii.; J. Bell's

* Monograph on the Causes and Treatment of Pseudarthrosis, and especially of that form of it sometimes called Supernumerary Joint. By Edward Hartshorne, A. M., M. D., in Amer. Jour. of Med. Scien. for Jan. 1841.

Principles of Surgery, vol. i. p. 587; Pott on Fractures and Dislocations, vol. i.; A Treatise on Dislocations and on Fractures of the Joints, by Sir Astley Cooper, 4to. London, 1822; Dupuytren sur la Fracture de l'Extrémité inférieure du Péroné, &c. in *Annuaire Medico-Chirurgical*, tom. i.; Roux's Narrative of a Journey to London in 1814, 2d edit. p. 159; Cross's Sketches of the Medical Schools at Paris; Practical Observations in Surgery, by Henry Earle, p. 17, octavo, London, 1823; Larrey's Surgical Memoirs; C. Bell's Observations on Injuries of the Spine and of the Thigh Bone, 4to.; Bell's Surgical Observations; J. Amesbury on Fractures of the upper third of the Thigh Bone, and Fractures of long standing, Lond. 1829; G. W. Hind, a Series of Plates illustrating the causes of displacement in the various Fractures of the Bones of the Extremities, folio, 1835; Description of a Splint invented for the Treatment of Fractured Limbs, by James M'Intyre, 8vo. Newcastle, 1825; Greenhow's Description of an Apparatus intended to facilitate the Treatment of Fractures, &c. 8vo. Lond. 1833; G. Gulliver, in *Edin. Med. and Surg. Journ.* 1835; Brodie on Fractures of the Vertebrae, in *Med. Chirurg. Transact.* vol. xx.; A Parallel between the flexed and extended Postures in the Treatment of Fractures of the Lower Extremities, by John Houston, M. D. 8vo. Dublin, 1836; Colles, in *Dub. Hosp. Reports*, vol. ii.; R. W. Smith, in *Dub. Journ. of Med. Science*, vol. vi.; W. H. Porter, in ditto, vol. x.; Mayo's Outlines of Human Pathology; Liston's Practical Surgery; Du Bandage Amidonné; *Receueil de Toutes les Pièces Composées sur ce Bandage Depuis son invention jusqu'à ce Jour, précédé d'une Esquisse Historique, &c. &c.*, par M. Seutin, Brussels, 1840, 8vo. On the Treatment of Deformities following unsuccessfully treated Fractures, by George Norris, M. D., in *American Journal of Medical Sciences*, No. 8, New Series, Oct. 1842.

On Artificial Joint, consult Physick's "Case of Fracture of the Os Humeri, in which the broken ends of the bone not uniting in the usual manner, a cure was effected by means of a seton," in the *New York Medical Repository*, vol. i. p. 122; Also, Caldwell's Appendix to Desault; Dorsey's Surgery, vol. i. p. 130; Brodie, in *Medico-Chirurgical Transactions*, vol. v. p. 377; Wardrop, in the same work, vol. v. p. 365; Roux's Journey, p. 172; Hutchinson's Practical Observations in Surgery, p. 162; Inglis on Unnatural Articulations, in *Edinburgh Medical and Surgical Journal*, vol. i. p. 419; White's Cases in Surgery; On the Treatment of ununited Fractures with the Seton, by Isaac Hays, M. D., in *American Journal of Medical Sciences*, No. xiii. November, 1830.

CHAPTER VIII.

LUXATIONS.

THE term luxation, or dislocation, implies the removal of the head of a bone from its corresponding articulating cavity. To designate the varieties of the accident other appellations have been usually employed—simple and compound, primitive and consecutive, recent and old, complete and incomplete luxation. By *simple* luxation is understood a mere removal of the head of a bone, accompanied by laceration of one or more ligaments—by *compound*, that variety of luxation in which an external wound communicates with the cavity of a joint. In *primitive* luxation, the head of the bone continues in the unnatural position it first assumed—in *consecutive* it abandons the first situation and becomes fixed in another. The terms *recent* and *old* refer merely to the duration of the injury, whilst *complete* and *incomplete* denote total and partial displacement.

All the articulations, with few exceptions, are liable to luxation; but the *orbicular*, on many accounts, are most exposed to such injuries. The direction of such luxations may be forwards, backwards, upwards and downwards. The *ginglymoidal* joints, on the other hand, are so constructed as to render their displacement, in most instances, extremely difficult. The direction may be forward, backward, inward and outward. External violence is the most common cause of luxation, though it is frequently produced by muscular action alone; in other instances the displacement is brought about by a preternatural laxity of the ligaments, or a paralytic state of the muscles surrounding the joint. Sometimes the head of a bone is slowly removed from its socket by disease, or by the growth of a tumour within the capsule. This is termed *spontaneous* luxation.

Parts recently luxated, when examined by dissection, commonly exhibit the following appearances. Besides laceration of the capsule and ligaments, most recent luxations are accompanied by an effusion of a greater or less quantity of blood in the neigh-

bourhood of the joint, by rupture or extension of tendons and muscular fibres, and by injury of nerves. However, the inflammation that follows, seldom terminates in suppuration, but slowly subsides; the effused blood is absorbed, and the functions of the injured parts are afterwards in a measure restored. In the mean time the head of the displaced bone accommodates itself to its new situation, and forms a cup in the cellular membrane, muscle, or bone, against which it rests, whilst adventitious ligaments are created from the surrounding cellular tissue, and either unite with the remains of the torn capsule or become fixed to the bone and secure it firmly in its place. After a time some motion is acquired, and the use of the limb may be partially restored.

Luxations are often confounded with other injuries, especially fractures; but from these they may be readily distinguished by want of crepitation: by the peculiar distortion and rigidity of the limb, which, according to the kind of displacement, is either lengthened or shortened, while the head of the bone is so fixed as to be nearly immoveable. Together with these signs an unnatural prominence or depression may be generally felt in the vicinity of the injured joint, but differing materially from that inequality often observed in fractures. *Compound* luxations are much more dangerous accidents than compound fractures.

TREATMENT OF LUXATIONS.

Constitutional as well as local means are generally necessary in the reduction of dislocated bones. The former, indeed, often exert greater influence over the action of muscles,—the chief impediment to reduction,—than any mechanical force, however powerful, that can be employed. The most efficient remedies of this description are blood-letting *ad deliquium animi*, the warm bath, nauseating emetics, intoxication, &c. Of these, blood-letting is decidedly the most powerful. The practice is said to have been first suggested by Monro the second, but was never, until the time of the late Dr. Physick, carried to an extent necessary for complete success.* Having derived full advantage from constitutional remedies, which should always precede any mechanical efforts to effect reduction, *extension* and *counter-*

* Dorsey's Surgery, vol. i. p. 225, 3d edit.

extension may be resorted to. For this purpose the hands of assistants, aided, if necessary, by napkins or sheets, should be employed; or pulleys, as they keep up a more steady and effectual extension, may be preferred. "In order to measure the force, says Professor Cooper, used in extension with pulleys, M. Malgaigne has invented and repeatedly used an instrument, termed a *dyanometer*. Mr. Weiss was kind enough to show me, some time ago, one which he has contrived; and Mr. Crosse informs us, that he has procured one which seems to answer every purpose." By Dr. Jarvis of Connecticut an ingenious instrument of great power and peculiar construction, has lately been invented for the reduction of dislocations. It is still a matter of dispute whether the extended force ought to be exerted upon the luxated bone or upon a remote one. Both expedients, it appears to me, are occasionally necessary; but as a general practice I prefer the latter mode, inasmuch as the muscles about the injured joint are less liable to be stimulated to contraction; whilst by increasing the distance between the luxated part and the extending force, a more powerful lever is procured. As a general rule, the counter-extending means should at least equal the extending, and both must be applied in such a way as to produce the least possible irritation. To obviate any inconvenience of this kind, the surgeon will often find it necessary to cover the skin with soft buckskin or some similar material. Sir Astley Cooper,* to prevent the extending bands from slipping, has suggested the expedient of confining them to the skin by a *wet* roller or bandage—the most ingenious idea, perhaps, contained in his valuable practical work.

The only general direction necessary to observe in relation to extension and counter-extension is, that the force be exerted gradually, and kept up for a considerable time, in order to fatigue the muscles and overcome their resistance. If this be well managed, a slight effort in the way of coaptation will generally prove sufficient to restore the bone, under circumstances where sudden and violent force would have failed. Old luxations should be treated upon the principles just laid down, but it may be found necessary to persevere in the efforts of reduction for a much longer period than in recent cases, and in addition to the extending forces, to break up by rotatory motions

* Treatise on Dislocations and Fractures of the Joints.

of the limb the adventitious ligaments about the head of the bone and new-formed socket.* Having restored the bone to its former place, it only remains to prevent its subsequent escape, and to procure, if possible, re-union of the edges of the torn capsule. This may frequently be accomplished by an appropriate bandage and by rest.

Compound luxations, if not judiciously treated, may terminate in death, or give rise to amputation. When the head of the bone projects beyond the wound and is covered with dirt, it should be carefully washed as soon as possible, with warm water, or with a camel's-hair pencil dipped in tepid milk. The finger should then be introduced into the joint to ascertain if any shattered portion of bone, or any extraneous body be there. These should be removed, if found, by a narrow pair of forceps; and if difficulty should arise, from the smallness of the opening, moderate dilatation may be safely practised. In some cases it will be absolutely necessary to take one or more short bones away, and in other instances to saw off the extremity of a long bone. In either case the wound must be dressed afterwards, very carefully, by drawing the edges together with adhesive straps, suffering the blood that oozes to coagulate between the lips, placing the limb in splints with openings for the escape of matter, and in such position as will enable the fluids to drain away. Purging should be avoided, in general, as well as blood-letting, and great care taken to sustain the constitution during the whole of the suppurative process. *Amputation* will sometimes prove necessary; but it is now a rare operation for such injuries, compared with what it was thirty or forty years ago. The circumstances under which it may be required will be stated hereafter.

* Great care, however, must be taken, in such cases, not to use too much force, or to attempt the operation upon all occasions, as explained in the third section.

SECTION I.

LUXATION OF THE LOWER JAW.

OWING to the peculiar conformation of the articulation of the lower jaw, luxation can take place in one direction only—*anteriorly*. Both condyles are usually dislocated at the same moment: though it often happens that one is removed while the other remains in its socket. In either case the *signs* of the accident are very decisive. When *both* condyles are displaced, the mouth is widely opened and cannot be shut, the coronoid process projects under the cheek bone, a depression is felt anterior to the ear, the saliva dribbles from the mouth, the patient speaks and swallows with great difficulty, and the pain, from pressure, probably, on the nerves which pass near the transverse roots of the zygomatic processes, is excessively severe. Dislocation of a *single* condyle may be known by the lateral distortion of the jaw, by the projection of one coronoid process, and by a hollow before the ear of the same side.

Excessive yawning, scolding, vociferation, or a blow upon the chin while the mouth is widely extended, are the most frequent causes of luxation of the lower jaw. Sometimes the accident is produced by a spasmodic action of the muscles, induced by an attempt to extract a tooth. In delicate females the lower jaw is occasionally subject to partial displacement, or to *subluxation*, from preternatural laxity of the ligaments.

TREATMENT OF LUXATION OF THE LOWER JAW.

Provided the luxation has not been of long standing, little difficulty is commonly experienced in reducing it. The patient should be placed on a low seat, with an assistant behind to support his head; the surgeon stands before him, and placing his thumbs deeply in the mouth, rests them upon the posterior molares teeth; whilst his fingers are carried beneath the chin and base of the jaw. Pressure is then made downwards by the thumbs to disengage the condyles from the roots of the zygomatic process; at the same time the chin is elevated by the fingers, and the condyles are suddenly dragged into their places

by the spasmodic action of the muscles. To prevent the thumbs from being injured by the sudden approximation of the teeth, they should be slipped to one side as soon as the surgeon perceives the jaw to yield, or they may be protected, before the operation is commenced by thick gloves. If the jaw cannot be reduced in this way, an attempt should next be made to replace first one condyle and then the other, and this plan seldom fails. To obviate a recurrence of the accident, the bandage for fractured lower jaw must be worn for eight or ten days.

For *subluxation* of the jaw, arising from extreme relaxation of the ligaments, Sir Astley Cooper recommends the shower-bath, a blister before the ear, and the internal use of ammonia and steel.

SECTION II.

LUXATION OF THE CLAVICLE, RIBS, AND VERTEBRÆ.

THE clavicle may be luxated either at its sternal or humeral extremity. Of the two accidents, however, the latter is most frequent, though neither is very common. The sternal portion is susceptible of luxation in three directions only—forwards, backwards, and upwards. Luxation downwards is effectually guarded against by the resistance afforded by the cartilage of the first rib. The *anterior* luxation is characterized by a hard rounded tumour, immediately over the top of the sternum, which recedes in proportion as the shoulder is carried outwards. Luxation *backwards* may be known by the preternatural hollow at the superior edge of the sternum, and by a projection over the lower part of the neck, while luxation *upwards* can be readily distinguished from any other injury, by the particular situation of the rounded end of the clavicle, and the close approximation of the injured bone to that of the opposite side.

Of these different luxations that *forwards* is almost the only one met with. It is generally produced by a forcible retraction

of the shoulders. Luxation *backwards*,* on the other hand, if it proceed from violence, must arise necessarily from the shoulder being carried forcibly forwards. To produce luxation in an upward direction, the shoulder should be forcibly depressed.

The *humeral* portion of the clavicle, when luxated, generally passes over the acromion process, and forms so considerable a projection on the top of the shoulder as to render the nature of the injury very evident. Sometimes, however, the extremity of the bone is forced downwards and glides *beneath* the acromion. The accident is commonly produced by a violent blow or fall upon the shoulder or scapula.

TREATMENT OF LUXATION OF THE CLAVICLE, ETC.

The *treatment* of luxation of either extremity of the clavicle does not differ in any respect from that of fracture of the same bone. It is hardly possible, however, to effect a cure without deformity.

It not unfrequently happens, that the sternal extremities of the *ribs* are separated from their cartilaginous appendages, and become protuberant. The sixth, seventh, eighth, and ninth ribs are most subject to this species of displacement. Luxation of the vertebral ends of the ribs, if not impossible, must be extremely rare. The most remarkable case perhaps on record, of luxation of the anterior extremities of all the ribs, is detailed by Sir Charles Bell in his "Surgical Observations." Luxations and fractures of the ribs must be treated upon the same principles.

The *vertebræ* are so seldom luxated, and the symptoms which follow any accident of the kind so violent and unmanageable, that it seems almost superfluous to notice such injuries. Indeed, it has been doubted by high authority,† whether luxation of the *vertebræ* ever occurs independently of fracture. There can be little question, however, that the *cervical* *vertebræ*, at least, are liable to complete dislocation. In such cases we commonly find that the *dentatus* is separated from the *atlas*, and its tooth-like process forced upon the spinal marrow so as to occasion instantaneous death. From the close and firm connexion between

* For an account of a very extraordinary case of backward luxation, see Sir Astley Cooper's Treatise on Dislocations, &c. p. 402.

† Sir Astley Cooper.

the atlas and the skull, it is hardly possible that the one should be separated from the other. Should luxation of any of the cervical vertebræ below the origin of the phrenic nerve take place, the patient may survive some time, or perhaps recover. Partial or incomplete luxations of the cervical vertebræ are now and then met with. I have seen a few cases of the kind, and a very interesting example of the accident was furnished me some years ago, by Dr. Julius Le Moyne, an eminent physician of Washington, in this State. Reduction was effected, and the patient recovered. A similar case was reported by Dr. Horner in 1843. In such cases the head is usually twisted to one side, and an attempt to remove the deformity or replace the bones does not always succeed, and may possibly terminate in death.

SECTION III.

LUXATION OF THE ARM.

OWING to the peculiar structure of the shoulder, and the extreme mobility of the arm, luxation is more frequent in this than in any other articulation. It may take place in three directions—*downwards*, *forwards*, and *backwards*. *Consecutive* luxation *forwards* and *upwards*, is occasionally met with. In this case the head of the os humeri abandons the unnatural situation it first occupied, and passes behind the clavicle. One case, however, of *primitive* luxation under the clavicle is recorded by Sir Philip Crampton. *Primitive* luxation directly *upwards*, however, can never happen, being effectually guarded against by the acromion and coracoid processes and their intervening ligament.

Luxation downwards, or into the *axilla*, is the most common, and usually results from force applied to the elbow while the arm is removed from the body and elevated. A depression below the acromion, a tumour formed by the head of the bone in the axilla, when the arm is carried from the body, an inability to perform the motions of circumduction, and a peculiar obliquity

of the arm outwards will, in general, be sufficient to enable the surgeon to distinguish the accident from fracture of the neck of the os humeri, or from any other injury. In recent luxations of the humerus downwards the capsular ligament will generally be found extensively torn on the inner side of the glenoid cavity, and the head of the bone resting upon the inside of the scapula between the triceps and subscapularis muscles. In some cases, also, the *tendons* of the supra and infra spinatus and subscapularis are lacerated, but that of the long head of the biceps is seldom injured. When the head of the bone has remained long unreduced, it forms for itself a new bed or socket, in which it rolls, and after a time may acquire a considerable extent of motion: the adhesions, too, and adventitious ligaments which are created from the surrounding parts may involve the adjoining arteries, and nerves, and closely connect them with the displaced bone.

Luxation of the humerus *forwards*, is commonly produced by violence applied to the elbow while the arm happens to be elevated and carried backwards beyond the body. It may also arise *from a blow* upon the head of the bone. In either case the capsule of the joint is ruptured at its anterior part, and the head of the humerus is pushed forwards and lodged beneath the pectoral muscles, below the clavicle, and on the inner edge of the neck of the scapula. The diagnostic marks of the accident are still more evident than those of luxation downwards. Besides the depression beneath the acromion, which accompanies every variety of luxation of the shoulder, the head of the humerus may be distinctly felt, and often forms a very conspicuous protuberance immediately below the clavicle. In addition to these symptoms the arm is shortened, the elbow carried out from the body and directed backwards, and upon rotating the arm, the head of the bone rolls beneath the finger in such a way as to render it almost impossible to mistake the nature of the case.

Although many have denied the possibility of dislocation of the humerus *backwards*, there are cases enough on record not only to establish its existence, but to point out clearly its symptoms and treatment. Still, however, the accident must be considered extremely rare, for during the space of thirty-eight years only two cases of the kind have occurred at Guy's Hospital.* Three instances of the same variety of dislocations have been

* See Sir A. Cooper on Dislocations and Fractures, p. 441.

reported to Sir A. Cooper, and others are mentioned by Boyer.* In 1811, the late Dr. Physick was called to a case of this description, produced by a fall through a hatchway; and I attended the same patient, (Mr. J. S., grocer in Market Street,) in 1822, for dislocation of the same shoulder into the axilla. Two cases have, also, been published, as having occurred at the Middlesex Hospital; and another is mentioned by Professor Cooper, as having taken place in the North London Hospital in 1835. In 1831, Dr. Snider of Tennessee, communicated to me a case of luxation backwards. The *signs* of luxation of the humerus backwards are, in addition to those common to the other varieties, a protuberance of considerable magnitude on the dorsum, below the spine of the scapula, formed by the head of the bone, and an approximation of the arm to the chest, across which the forearm is obliquely thrown. A violent *blow or fall* upon the front of the shoulder is the most frequent cause of this dislocation. This fact was *first* made known by the late Dr. Physick.

Partial or incomplete luxation of the os humeri is sometimes met with. In such cases the head of the bone is generally forced towards the anterior part of the glenoid cavity, and rests against the coracoid process. *Compound* luxation of the shoulder is extremely rare.

TREATMENT OF LUXATION OF THE ARM.

Recent luxations of the shoulder are often reduced by very slight extension and counter-extension. Much, however, will depend upon the kind of displacement, and the direction in which the efforts are made. A good general rule to observe in all luxations *downwards*, is to extend the arm as nearly as possible in the line of the body, instead of carrying it off, as is usually done, at right angles. In nine cases out of ten the most effectual plan is to stretch the patient upon a mattress, table, or floor; the surgeon then, by placing a heel in the axilla, makes counter-extension and extension by pulling at the wrist. Should this process be found insufficient, owing to the resistance of the muscles, the forces may be increased by folding a sheet diagonally, placing the centre of it in the axilla, carrying the ends

* Treatise on Surgical Diseases, vol. ii. p. 256.

over the opposite shoulder and securing them to a staple or post—taking care previously to fill the axilla with a ball of linen or some similar substance, to take off pressure from the edges of the pectoralis major and latissimus dorsi muscles. Another sheet or towel, folded in a similar way, must next be secured to the wrist or above the elbow by a wet roller, and its ends given to two or three stout assistants. It only remains to fix the *scapula*, without which extension and counter-extension would prove of little service. This is done by a third sheet, the middle of which is placed upon the acromion process, and there held by another assistant, while the ends are carried across the chest and firmly secured at the opposite side. Should these means also fail, recourse may be had to the pulleys, still keeping the patient in the horizontal position, and merely substituting the pulley for the *extending* band. If, in spite of these efforts, the head of the bone still remain unreduced, it may be well to remove the apparatus, and fixing the patient on a low seat in an upright position, proceed in the following way. Pass the middle of a broad sheet around the chest, and fasten its ends securely at some distance from the patient, and opposite the injured shoulder. Then roll the arm just above the elbow in soft buckskin; over this place the middle of a napkin, and bind it by a roller to the arm. Next tie the ends of the napkin together, and hook them upon a pulley fastened at the floor. Lastly, secure the scapula by passing the centre of a towel or leathern strap, hollowed out for the purpose, over the acromion process, and give the ends in charge to one or more assistants, seated upon the floor next to the sound side of the patient. Every thing being ready, the surgeon takes hold of the patient's forearm, and bending it across the chest, uses it as a lever, and communicates a rotatory motion to the arm, while an assistant is directed to keep up a very slow and gradual extension by tightening the cord of the pulley.

This plan seldom fails, (provided the force employed is continued a sufficient time and without violence,) especially when conjoined with blood-letting, nauseating antimonials, &c. Sir Philip Crampton in most cases of luxated humours prefers the lever of a pole or ladder to the pulleys.

Old luxations of the os humeri should be treated in a similar way, though equal success is not to be expected. It is important to know, however, that the head of the bone has been re-

stored to the glenoid cavity after the lapse of *four* or *six* months. Galliard has lately succeeded after the lapse of sixteen years in a *congenital* case. In all such cases, Desault's plan of lacerating the capsule and new-formed ligaments by forcible rotation of the arm has been pursued. Danger seldom results from this, provided the head of the bone has formed no accidental connexion with the axillary artery. Under such circumstances, the rupture of the vessel will be the inevitable consequence of restoration of the bone, whether effected by violence or by gradual extension; as happened at the Philadelphia Hospital some years ago, in two cases, the particulars of which I have detailed at full length in another publication,* and which I now transfer to these pages, in order that they may be circulated widely, and be constantly before the eye of the young surgeon.

James Scofield, fifty years of age, of intemperate habits, and foreman to the Penns-Grove Cotton Factory, on Chester creek, applied to me on the 10th of May, 1823, on account of dislocation of the left arm, at the shoulder joint, produced two months before, by the weight of a heavy chest, which fell upon him, from a cart, while he was driving it along the road. A physician was immediately sent for, who stated that the arm was fractured just above the elbow, and must be secured by splints and bandages. These were accordingly applied, and continued about two weeks, when the bone was declared so far united as to render the dressing unnecessary. No notice, according to the patient's account, was taken of the *shoulder*, although, from the first, the swelling had been considerable, and the pain very severe. A short time afterwards the patient consulted Dr. Dutton, of Village Green, Delaware county, who discovering that the os humeri had been luxated at the shoulder, and still remained displaced, determined to make an effort to restore it to its natural situation. With this view the patient's body was securely bound and rendered immoveable; three pints of blood were drawn from the right arm, whilst a strong sheet was twisted round the injured arm, above the elbow, and its ends given to five strong men, who were directed to keep up a constant and steady extension, which was continued for some time, and frequently repeated, but without any benefit. The patient suffered, as he remarked, a good deal, from this attempt to restore the bone to

* See the Philadelphia Journal of the Medical and Physical Sciences, vol. vii. p. 81, 1823; and ditto, No. iii. May, 1828, p. 136.

its place, and was debilitated by the loss of blood; still he was willing to undergo any torture, provided there was the slightest probability of his arm being again rendered useful. For this purpose he came to Philadelphia, and consulted Dr. Humphrey, by whom he was referred to me. It was evident upon examination, that the head of the os humeri had been separated for a considerable time, from the glenoid cavity; for I found it so firmly lodged in the axilla, that the arm would scarcely admit of any motion, and the slightest movement occasioned pain. After explaining to the patient the uncertainty of any benefit resulting from a further attempt to reduce the bone, and pointing out to him the suffering that must necessarily follow the efforts to restore it, I determined to make the trial, and for this purpose requested him to meet me on Monday, the 12th of May, at the Philadelphia Hospital. Having arranged the necessary apparatus, I desired Mr. Gregg, one of the house pupils, to bleed the patient in the right arm. While the blood was flowing, a buckskin band, with an iron plate and ring secured to it, was fastened around the wrist. A large roller was then fixed in the armpit, and over this a sheet folded diagonally, the ends of which were carried before and behind the chest, towards the opposite shoulder, and fastened to a hook. This sheet served for the counter-extending band. Pulleys were next attached to the ring at the wrist, and every thing being prepared, I commenced the operation, (in presence of Drs. Humphrey, Horner, Jackson, the resident physicians, and students of the house, and several other spectators,) by setting the pulleys in motion, and keeping up for several minutes, a continued but steady extension and counter-extension. This fatigued the muscles of the arm considerably, and the patient was sensibly affected by the loss of nearly two pounds of blood, but did not faint. I then relaxed the pulleys, and taking hold of the arm, near the elbow, used it as a lever, and communicated a rotatory motion, in hopes of breaking up the adhesions and adventitious ligaments connecting the head of the bone to its new socket. Additional attempts were made with the pulleys, apparently without the slightest effect. Dr. Horner now proposed to change the direction of the force of the counter-extending band, by fastening a hook in the floor, seating the patient on a chair, and passing the middle of a strap over the point of the acromion process, in order to secure the scapula. This was also tried, but with no better success. I next disengaged

the extending and counter-extending bands, and laying the patient out upon the table, placed one of my heels in the axilla, while I produced extension by pulling at the patient's wrist. The same was done by house pupil Strudwick. Finding these efforts unavailing, another attempt was made by means of sheets, fastened above the elbow and under the armpit. Five or six assistants took hold of the ends of each, and pulling steadily for some time, the head of the bone was perceived gradually to yield. It quickly returned, however, nearly to its former position, as soon as the efforts were discontinued. By this time the patient was greatly exhausted, and the muscles very much relaxed, when Dr. Horner requested him to lay on the floor, and at the same time stretched himself down opposite to him, and taking hold of the wrist, made a continued but forcible extension, while counter-extension was effected by his heel in the axilla. During these efforts the head of the bone gradually approached the glenoid cavity, and at least entered it. The slightest movement, however, was sufficient to throw it out again, which led me to suppose that a portion of the capsule might be interposed between it and the socket, and would require further laceration before the reduction could be entirely accomplished. But the patient was too much overcome to make any further attempt at that moment, and was therefore put to bed. On visiting him half an hour afterwards, with Dr. Humphrey, I found the head of the bone resting on the lower edge of the glenoid cavity, and a hollow under the acromion. I took hold of the arm, and made two or three slight rotatory motions, when it slipped suddenly into its place, and was completely reduced. There was a general swelling about the deltoid and pectoral muscles, which was noticed both by Dr. Humphrey and myself, but supposing it to be an approach to inflammation, a consequence to be expected after the efforts made to restore the head of the bone, nothing was apprehended from it. The swelling increased, however, very slowly, for several hours, and although remarked by the house pupils and attendants, did not excite any alarm, inasmuch as the patient complained of little pain, and conversed cheerfully with some of his friends during the greater part of the afternoon. About six o'clock in the evening, Dr. Brinton, one of the house pupils, visited him, and hearing that he had a short time before turned over in bed, in order to sleep, and struck with the unusually pallid appearance of his face, was induced to suspect

that some unfavourable change had taken place. These suspicions were confirmed, for upon examination the pulse was found scarcely perceptible, and the whole system so much sunk as to render recovery impossible. Leaving Dr. Hopkinson in charge of the patient, Dr. Brinton immediately repaired to my house, and informed me of his condition. Before I could reach him, however, he expired. The appearance of the shoulder and adjacent parts soon explained, it seemed to me, the nature of the case; for the pectoral muscle was considerably elevated, and the skin, for some distance about the chest and shoulder, discoloured and ecchymosed, showing, in all probability, that some large artery or vein had been torn across, during the efforts to reduce luxation. To determine this point with accuracy, I obtained the consent of the patient's friends to examine the body, and at ten next morning the dissection was made by Drs. Horner and Lawrance, in presence of Drs. Humphrey, Jackson, the house pupils, several students, and myself.

DISSECTION.

Three incisions were made—one from the acromion process, along the course of the clavicle, as far as the sternum—another perpendicular to the sternum, and about ten inches long—a third nearly at right angles with the lower extremity of the perpendicular one, and running across the chest towards the armpit. The integuments and pectoral muscles being elevated along the edge of the sternum, and thrown backwards towards the shoulder, a considerable quantity of coagulated blood was found, filling the cellular membrane, and lying in masses between the interstices of the muscles. In order to ascertain the condition of the large vessels beneath the clavicle, this bone was separated at its juncture with the sternum, and raised. The course of the subclavian artery and vein was then distinctly seen. A small opening was made in the vein, into which a bougie was introduced for several inches, towards the axilla, as a guide during the dissection; but the vessel was found perfectly sound throughout. Under the vein, as it passes near the glenoid cavity, a large mass of coagulated blood was observed, and upon clearing this away, the axillary artery was seen protruding, with its mouth open, having been torn directly across and separated from its connexions.

Upon further examination, it was discovered that the head of the bone at the time of the luxation had been carried downwards into the axilla, about an inch and a half below the glenoid cavity, where it formed a white ligamentous cup-like socket, in the subscapularis muscle, and, pressing upon the axillary artery, produced such a degree of inflammation as gave rise to a copious effusion of coagulable lymph, which united the artery completely for some distance, to the capsule of the joint, where it surrounded the neck of the bone.* The lower part of the capsule was torn and separated from the neck of the humerus; the upper part remained entire, and was very much thickened. The head of the bone filled completely the old socket or glenoid cavity. Beneath the deltoid muscle there was a large hollow filled with blood, and the whole arm, as far as the elbow, had been extensively injected with the same fluid. The os humeri was carefully dissected from the condyles to its head, and the periosteum entirely scraped off, without showing the slightest vestige of a fracture. The long tendon of the biceps was found considerably elongated, but not ruptured.*

REMARKS.

The foregoing case must be considered, in every point of view, extremely interesting; it was mistaken, it appears, by the physician who first saw it, for a fracture near the elbow, and treated accordingly; a few weeks afterwards the true nature of the disease was discovered by another practitioner, and an attempt made, but without effect, to restore the head of the bone to its natural situation. The patient finding his arm useless, and unable to follow his occupation, determined, notwithstanding his previous suffering from one operation, to submit to another. The trial was made, under every disadvantage, the head of the bone restored to its socket, the axillary artery torn across, owing to an accidental adhesion between it and the capsule of the joint, which could not be foreseen, and the patient died. Persons acquainted with the difficulties often encountered even in the most simple cases of luxation, will readily understand, without comment, the peculiar nature and the inevitable result of the

* The diseased part being removed, was carefully prepared by Dr. Lawrence, and presented to the Wistar Museum, where it may at any time be inspected.

case I have detailed. For those who possess little practical information on the subject, and who may, perhaps, be led to condemn the efforts to relieve the unfortunate patient, as rash and unwarrantable, the following observations are chiefly intended.

The head of the humerus may be forced from the glenoid cavity of the scapula, and lodged in different situations. In nine cases out of ten, however, it rests in the hollow of the armpit, having previously ruptured the inferior portion of the capsular ligament. The tumour, formed by the head of the bone, in the axilla, and the unnatural hollow under the acromion process, are signs so decisive of the nature of the accident as not to be overlooked, except by the most careless or ignorant practitioners. To restore the bone to its original position, the surgeon makes *extension* and *counter-extension*, either by the hands of strong assistants, (some of whom take hold of the dislocated arm and pull steadily, but forcibly, whilst others resist, by securing the body or shoulder,) or by towels, or sheets, straps or pulleys, as the case may require. If the force be well directed, and continued sufficiently long to fatigue the muscles, and thereby overcome their resistance, the head of the bone generally slips into its place without much difficulty. But the slit or rupture in the capsule remains open for a considerable time, and in many instances never closes. Under these circumstances, the patient is continually liable to a recurrence of the accident, and the slightest effort will sometimes be sufficient to induce it. It not unfrequently happens that the surgeon finds it impossible, by the most powerful extension and counter-extension, to restore the head of the bone, even in the most recent cases. This is owing generally, as is now well understood, to the rent in the capsule being too small to admit the head of the os humeri to pass through and enter the glenoid cavity. When such difficulties exist, the surgeon discontinues the extending and counter-extending forces, and taking hold of the arm, uses it as a lever, and communicates a rotatory motion to it, the chief object of which is to tear up and enlarge the opening in the capsule. This being done, a very slight effort in the way of extension, will probably be sufficient to reduce the bone.

When the head of the bone, instead of being restored immediately to its proper cavity, is suffered to remain in the armpit, for weeks or months, it will be found in a very different condition from that last described; inflammation takes place, adhesions

form between the bone and surrounding parts, adventitious ligaments are created, a new socket is produced, the old one partially or entirely filled up, and the bone, after a short time, almost as firmly fixed as it was in its original position. Previous to the time of the enlightened but adventurous Desault, such a case was deemed hopeless and irremediable. This great surgeon conceived the possibility of restoring the use of the arm, under these almost desperate circumstances, and succeeded in several cases of one, two, three, and four months' standing, by the following means. "Previously to making extension," says he, "it is necessary to move the bone *very forcibly* in every direction in order first to break the adhesions, to tear the condensed cellular membrane, which serves as an accidental capsule, and to produce, so to speak, a second luxation, with a view to make way for a perfect reduction of the first. The straps being then applied, as in ordinary cases, serve the purpose of extension, for the accomplishment of which, the number of assistants must be increased. Oftentimes the first efforts are fruitless, and the luxated head remains stationary, amidst the *most violent efforts*. Let the extension then be discontinued: renew the *forcible motions* of the limb: carry the humerus upwards, downwards, forward and backward; *force the resistances* to give way; make the arm describe a large arc of a circle round the place which it occupies; let the rotatory motions on its own axis be impressed on it anew; and then recommence the extensions, and let them be made in every direction. By these, the head, already disengaged by means of the preceding *violent motions*, will be brought to a level with the glenoid cavity, and ultimately replaced."* From these extracts it will be seen, that Desault strongly inculcates the employment of *forcible* and even *violent* exertions in the reduction of all old luxations of the os humeri; the success, indeed, which he met with, almost invariably, and that too, in many instances, after other practitioners, who employed milder means, had failed, was such as seemed to justify the practice completely, and induce other surgeons, both in Europe and in this country, to follow his example. The practice, therefore, has long since become general and established, so much so, that the surgeon who should refuse to attempt to relieve his patient because the head of the bone had remained out of the socket several months, would be considered culpable by

* Desault's Works, by Caldwell, p. 144.

all intelligent members of the profession. Dr. Physick has "in a variety of instances, succeeded after two and three months."* The late Dr. Dorsey, one of the best informed and most accomplished surgeons of this country, entirely approved of Desault's practice, and followed it successfully in several cases. Dr. M'Kenzie, of Baltimore, replaced a dislocated os humeri nearly six months after its luxation.† The same has subsequently been accomplished by Mr. Kirby,‡ of Dublin. For the last eighteen or nineteen years, I have repeatedly reduced luxations of the shoulder, and some other joints, from two to four months' standing, and although in several instances, the adhesions surrounding the head of the bone and the new socket were so considerable as to require great force and extensive laceration, not the slightest accident has ever occurred. The records of surgery, indeed, furnish very few examples, so far as I am acquainted, of injury, much less of death, resulting from attempts to restore the head of the bone even after it had been displaced for a very long period. Desault details the history of one case in which either a large emphysematous or bloody tumour formed under the pectoral muscle immediately after the head of the os humeri had been restored to its glenoid cavity. "Scarcely was the reduction accomplished, when a tumour rose suddenly under the pectoralis major, propagated itself towards the armpit and occupied immediately its whole extent. All the assistants, astonished at the phenomenon, knew not to what circumstance to attribute it. Desault himself, a little embarrassed, thought first of an aneurism suddenly produced by the violence of the extension. The pulse of the patient being scarcely perceptible in the side affected, and a syncope, which supervened, appeared at first to favour this suspicion; but immediately the absence of a fluctuation, of a pulsation, and of a change in the colour of the skin, the return of the pulse, the circumscription of the tumour, its resistance and the sound caused by striking on it, produced a belief that it was owing, not to an effusion of blood, but to a disengagement of air that had been confined in the now lacerated cells of the cellular membrane. On the thirteenth day, the tumour was entirely gone. In the place which it had occupied a large ecchymosis appeared, produced, no doubt, by the rupture of the small

* Dorsey's Elements of Surgery, vol. i. p. 237.

† Ibid.

‡ Kirby's Cases, with observations on Wryneck, the reduction of luxations of the shoulder, &c. p. 53.

vessels at the time of reduction.”* This patient recovered perfectly in less than a month after the reduction, and no other similar case is mentioned, that I know of either by Desault or any other writer.

Although most writers on dislocations seem to think a rupture of the axillary artery, from attempts to restore the bone after it has been displaced a few weeks, a possible occurrence, yet I have not been able to find, after very diligent research, a single instance of this description, except one, which is merely glanced at by Sir Charles Bell. “In this violent operation,” says he, “one can imagine that if the axillary artery were at all diseased, it might be torn; but I have not known of such an accident, though I have known such an ecchymosis succeed the operation of reduction as would imply the rupture of some considerable vein. In employing the ambe in the New-Castle Infirmary, both the axillary artery and the muscles have been torn, so that they were obliged to amputate on the instant.”† Sir Charles Bell is silent as respects the event of the case; there is every reason to conclude, however, that it could not have been otherwise than fatal. A very remarkable instance has been recorded by Loder of high inflammation, mortification and death, from an attempt to reduce a luxation of several months’ duration. “When Loder was studying at the Hotel Dieu at Rouen, a man came to the hospital on account of some trifling complaint. The celebrated M. David, then the principal surgeon of that establishment, perceived that the patient had also a dislocation of the left arm. The displacement had already existed several months, and the limb had acquired some degree of mobility. M. David recommended making a fresh trial to reduce the bone, and the patient’s consent being obtained, the attempt was made with immense force, and the arm restored to its proper place again; but the event was most disastrous; for the whole limb was attacked with such violent pain and inflammation, that notwithstanding every means which surgery could suggest was immediately put in practice, mortification ensued, and the patient lost his life.”‡

The foregoing observations are calculated to exhibit the treatment of luxations of the os humeri as sanctioned and pursued by

* Desault’s Works, p. 149.

† Bell’s Operative Surgery, vol. ii. p. 247.

‡ First Lines of the Practice of Surgery, by S. Cooper, vol. ii. p. 466.

the best surgical authorities, and to show that the practice thus established, if not uniformly successful, has, with the exception of two or three cases, been unattended with danger. A question, however, may possibly arise—whether surgeons should be influenced by the event of the case I have detailed, and of those I have quoted, and deterred altogether from attempting reduction in dislocations of long standing, or whether the established practice should still be continued, unaffected by fortuitous circumstances or contingencies neither to be foreseen nor controlled? To the latter proposition I have no hesitation to give unqualified assent, and to declare, that should a case similar in external appearance to that of James Scofield again occur, I shall feel justified in adopting a similar course.

John Langton, aged thirty-five, a muscular athletic man, about six feet high, a labourer, accustomed whilst at work to the use of a pint of spirits daily, called upon me on the 6th of March, 1828, and presented a letter from Dr. Lewis Horning, dated Millerstown, Pennsylvania, recommending him to my notice on account of a luxation of the left os humeri at the shoulder-joint. From the patient I ascertained that the accident had occurred nine weeks before from a violent fall upon the shoulder; that soon afterwards attempts had been made four different times to replace the bone, but without effect; that very considerable force had been employed each time, and that upon one occasion his body had been suspended upon the axilla over the top of a door.

On the 6th of March, the patient was admitted into the Philadelphia Hospital, and placed on low diet and the antiphlogistic system. This treatment was commenced about the fourth day after his admission. He was bled, regularly, to the extent of $\frac{3}{4}$ x. daily, kept on barley water, purged occasionally, had the shoulder carefully rubbed with oils, and the arm gently moved, several times a day in various directions.

This plan was pursued unremittingly until the 15th of March, on which day it was determined to attempt to restore the bone to its natural situation. Assisted by Drs. John R. Barton and R. Harlan, and by the house pupils, and in presence of Drs. Jackson and Mitchell, Dr. Canby of Indiana, and several medi-

cal students, I commenced the operation, by extending the patient upon a long narrow table, covered with blankets, placed a soft ball of old linen in the axilla, over this a *counter-extending* band which was fastened to a staple, then an *extending* band above the elbow with its ends secured to a pulley, which pulley was also attached to a staple, and lastly secured the scapula by a band so contrived as to embrace the acromion process like a cap, and thence extending across the body, obliquely downwards, and held by two assistants, seated upon the floor. The apparatus being thus arranged, the forearm was bent upon the arm at a right angle, and used occasionally, by Dr. Barton and myself, as a lever through the medium of which very slow and gentle rotatory motions were communicated to the head of the displaced bone, whilst at the same time, the pulley under the *management* of Dr. Harlan, kept up a very moderate and continued extension for at least half an hour.

Not appearing to have the desired effect, this mode of proceeding was laid aside, and the patient placed in the upright position on a stool, and extension and counter-extension again employed by pulleys secured to staples in the floor. All our efforts thus made proving equally unavailing, we determined to lay the patient again on the table and to renew our former attempts. Accordingly extension and counter-extension were kept up in the horizontal direction for another half hour, but without much impression being made, apparently, upon the muscles of the arm. Under these circumstances, a pupil was directed to open a vein in the right arm; from this twenty ounces of blood were drawn, without inducing syncope. To bring about, if possible, this state of the system, twelve grains of tartrate of antimony, dissolved in four ounces of water, were ordered, and gradually administered without producing any other effect than slight nausea. Our efforts, notwithstanding, were continued *in the most gentle and cautious way possible*, sometimes by the pulleys, sometimes by the heel in the axilla, when we had the satisfaction at last to find the head of the bone gradually approach, and finally enter, with an audible snap, the glenoid cavity, but not until the lapse of one hour and three quarters from the commencement of the operation.

The patient, after being put to bed, complained chiefly of weakness, of numbness throughout the arm, of slight excoriation of the armpit and bend of the arm, from the counter-extending

and extending bands, and was smartly purged by the tartar emetic given during the operation. In other respects, he said, he was comfortable, and slept during the night without an opiate.

March 16th.—I saw him at eight in the morning, and observed a general swelling over the deltoid and part of the pectoralis major muscles, but not more than could have been expected under similar circumstances. Upon pressing, however, upon the most prominent part of the swelling, I was surprised to find a distinct pulsation of an aneurismal character. During the day, both the swelling and pulsation slowly increased, and satisfied me that an aneurism existed in the axillary artery. Dr. Barton saw the patient in the afternoon, and drew the same conclusion.

March 17th.—At 10 o'clock A. M., Drs. Barton, Harlan and myself, saw the patient in consultation. The tumour and pulsation were somewhat greater than on the preceding day. At 3 o'clock, P. M., we saw him again, and the tumour appearing still to augment, though slowly, it was decided that the *subclavian artery* should be tied without delay, lest the clavicle should be so raised by the aneurism as to render the operation afterwards very difficult, if not impossible. Accordingly I commenced the operation almost immediately, in presence of Drs. Fearn, Pickering, Knox, Montgomery, Johnson, the house pupils, and several medical students, (assisted by Drs. Barton and Harlan,) by extending an incision from the acromial margin of the sterno-mastoid muscle, for three inches and a half along the course of the clavicle, through the integuments, platysma, myoides, &c., until the external jugular vein was exposed. This vessel being held aside by a blunt hook, the incision was gradually, and very cautiously deepened, by the alternate use of the edge and handle of the knife, until the subclavian artery was laid bare, just where it passes the edge of the anterior scalenus muscle, and lies on the first rib, and its pulsation distinctly felt. I next attempted to pass a blunt steel needle, armed with a strong round ligature, made of saddler's silk, fixed in Physick's forceps, but the needle broke near its eye, in the act of pushing it beneath the vessel. The instrument employed by Wardrop for tying the carotid artery, (consisting of a flat silver cannula, containing a steel stilet,) was next tried, but without effect. At last, though not without some difficulty, the common silver aneurism needle was

passed beneath the vessel, without disturbing its connexions,—except in the slightest degree. The attending surgeons, and most of the spectators, having satisfied themselves that the ligature had been fairly deposited beneath the vessel, without including any of the nerves or other parts in its vicinity, it was tied by three firm knots—at the depth of three inches below the clavicle, nearly in a perpendicular direction—when the pulsation in the tumour ceased instantaneously.* The edges of the wound were brought together with adhesive straps, supported by lint and a compress, the patient put to bed, and forty-five drops of laudanum administered. In fifteen or twenty minutes after the operation, the tumour, which previously was tense and elastic, was found much diminished, soft and flaccid to the touch.

* Having experienced much greater difficulty than I expected, in passing the ligature between the subclavian, I called, soon after the operation, upon Mr. Schively, one of the most ingenious cutlers in the United States, and requested him to make for me an instrument, of the exact shape and size of the ordinary aneurism needle, calculated to hold a steel stilet, capable of being passed, without difficulty, beneath deep-seated vessels. His ingenuity soon removed the defects usually complained of, and produced an instrument, which, I do not hesitate to say, in point of simplicity and usefulness, is as yet unrivalled, if I may judge from an experiment I have since performed upon the subclavian artery of the dead subject, in presence of Messrs. Hall, Nott, and Levert. It consists of a silver cannula, fixed in a wooden handle, surrounded, (near the part where the cannula joins the handle,) with a silver collar, through which a steel stilet, made of a narrow watch-spring, the length of the instrument, passes, and immediately afterwards enters an opening just below the collar, in order to pass the whole cavity of the cannula and emerge at its point. This extremity of the stilet is covered with a flattened silver cap moderately blunt, whilst its other or *upper* extremity, passing upwards, from the collar above mentioned, lies parallel with the handle and has an eye near its end for holding a ligature. A small screw, for the purpose of fixing the stilet while the surgeon is in the act of passing the instrument beneath the artery, works through the silver collar, and may be used or not, as the surgeon pleases.

It will be seen at once, that the great advantage which this instrument possesses over those in common use is, that the ligature being held by the *upper* instead of the lower end of the stilet, the surgeon can draw the stilet along with the ligature, at once, through the cannula and under the vessel—whereas, in other instruments, the ligature being passed through the *lower* end of the stilet, must, after having been carried below the artery, be in part retracted again before the surgeon can tie it. An additional stilet, if necessary, with a *sharp* point, may accompany the instrument.

The use of the instrument, however, as well as its form and size, will be better understood by the drawing in Plate XVII. Figs. 2 and 3.

6 o'clock in the evening—patient expressed himself easy and comfortable. Heat of the limb apparently somewhat greater than it was immediately after the operation.

10 o'clock at night—complains of thirst, and is restless—heat of the arm not perceptibly increased. Being unable to see the patient during the night, and only at particular intervals during the day, I requested house pupil Chew to keep an accurate account of the symptoms and treatment—and the following is his statement.

March 18th.—9 o'clock, A. M.—Slept but little last night—having been disturbed by dreams and pain in the arm. He feels less pain, however, this morning, though the sensibility of the arm is somewhat increased. Temperature of each arm equal—95°. Last evening the temperature of the left arm, was 94°; that of right, 96°. Pulse not yet felt in the arm operated upon. In the other it is 100, and rather tense. Tumour has subsided very much. Thirst not great. Barley-water continued as drink and diet.

“3 o'clock, P. M.—No material alteration.

“9 o'clock, P. M.—Little or no pain in the arm, but complains of a disagreeable, tingling sensation, which frequently begins at the shoulder, runs down the arm, and seems to pass out at the elbow, leaving a sensation in the forearm and hand, as if they were enlarged to the size of a foot in diameter. There is only a sense of soreness in the wound. Temperature of the arm unaltered. No pulsation perceptible at the wrist. Pulse in the right arm one hundred and twelve, small and tense.

March 19th, 9 o'clock, A. M.—Little sleep last night—owing to dreams and starting. No material change in pulse or temperature.

“3 o'clock, P. M.—Pulse more frequent, (128,) quick, small, and tense, but more irritable than febrile. Temperature of right arm, 96°; of left, 98°. Skin dry, but heat of it not in proportion to frequency of pulse. Bowels not moved since the copious purging produced by the tartrate of antimony, administered during the attempt at reduction. Ordered sulph. magnes. \bar{z} j. aq. pur. \bar{z} vij.— \bar{z} ss. occasionally until it operates.

“9 o'clock, P. M.—Bowels have been gently opened twice. Pulse less tense, though still frequent, quick, and irritable. Skin moist. Complains only of some soreness about the wound. No pain in the arm. The tingling sensation, and sense of en-

largement of forearm and hand, not so troublesome. Sensibility of arm slowly increasing, but the pulse at the wrist not yet distinguishable.

"12 o'clock at night.—Skin dry, with restlessness. No other important change. Ordered acetate of opium, gtt. xx.

March 20th, 9 o'clock, A. M.—Slept tolerably well last night, after the opiate. Pulse 128, but not so quick and irritable as last night, though small and tense. Skin about the neck and face a little jaundiced and moist. No pain. Has a keen appetite, but allowed only barley-water.

"9 o'clock, P. M.—No material alteration during the day, except a reduction of temperature in both arms—being 94° in each.

"11 o'clock, P. M.—Has not slept, nor inclined to sleep. Ordered acetate of opium, gtt. xx.

March 21st, 9 o'clock, A. M.—Slept about four hours during the latter part of the night. Occasionally disturbed by dreams, delirium, and starting. Pulse more frequent, (136,) has lost much of its quickness and tension, and is smaller and weaker. Skin moist. No pulsation in left arm. Temperature of it 98°; that of right arm 96°. Spots of erysipelatous inflammation about left shoulder, and whole limb considerably swollen. Dr. G. ordered the wound to be dressed. Done in presence of himself, Drs. Barton and Harlan. Sides found in contact and a little pus formed. Surface of the skin around the wound carefully washed with warm water: adhesive straps and lint reapplied. Better diet ordered, consisting of oysters, soft eggs, and porter and water.

"3 o'clock, P. M.—Has taken moderately of the diet last directed; pulse 128, somewhat quicker, more tense.

"9 o'clock, P. M.—Some increase of pulse, both in tension and volume. Skin not so moist. Bowels have been slightly opened. Continues the same diet. Is restless. Ordered acetate of opium, gtt. xx.

March 22d.—Sleep more disturbed last night than heretofore. Is now dull and inclined to sleep. Pulse 140, small and weak, with some fluttering. The capillary circulation of left arm exceedingly languid. Its temperature, 93°. That of the right arm, 94°. Ordered by Dr. G. carbonate of ammonia mixture and quinine, and the arm to be enveloped in wool. Same diet continued, but has no appetite. The erysipelatous inflammation

spoken of yesterday, has increased. The hand is covered with purple spots, and its temperature somewhat less than that of the forearm.

"3 o'clock, P. M.—The pulse improved a little in strength; is more distinct and not so fluttering. Has taken, since morning, carbonate of ammonia and quinine alternately, every hour. Diet continued, with wine whey. Discoloration of the hand increasing and extending to forearm, though the sensible heat about the same. Considerable determination of blood to the head, which is hot, attended by muttering, delirium, and increased restlessness.

"9 o'clock, P. M.—Pulse improved, since morning, in distinctness and artificial strength—the result of the stimulating treatment. An increased termination to the head, and delirium. Has recently taken gtt. xx. of acetate of opium, and ten more will be given in an hour. Ordered wine whey, freely throughout the night. Temperature of the arm and hand preserved by warm flannel.

March 23d, 9 o'clock, A. M.—Has had a very restless night. Pulse more frequent, (160,) much smaller, thready, weak, and fluttering, although the carbonate of ammonia, quinine, and whey have been continued. Heat of head and delirium aggravated. Hand and forearm more swollen, with increase of lividity. Cutaneous vessels greatly distended, and apparently in a state of congestion. Patient cannot distinguish one attendant from another.

"4 o'clock, P. M.—Died.

(Signed)

"E. R. CHEW."

March 24th, 1 o'clock.—The parts having been previously injected, the dissection was commenced by Dr. Ashmead, in presence of Drs. Barton, Harlan, Jackson, Pennock, Temple, Hunt, Wragg, Bettner, Hall, Nott, Chew, Peace, Levert, Barker and myself. It was soon found, however, that the injection was not sufficiently firm to enable the dissector to proceed in a satisfactory manner, and, besides that, the parts were so changed from their natural relations, as to require more time to be consumed in the investigation, than could be spared by most of the gentlemen present at the examination. On these accounts the dissection was postponed until the afternoon, and then resumed by Drs. Ashmead and Hall, in the presence of occasional visitors.

Dr. Hall not having been present, (owing to indisposition,) during the reduction of the dislocation, I was anxious that the dissection should be made, and the account of it drawn up by himself; and he has obligingly furnished me with the following communication:—

“Philadelphia Almshouse, March 24th, 1828.

“*Dissection of John Langton, sixteen hours after death.*—The left hand and forearm exhibited marks of incipient gangrene, extending only to the skin and subjacent cellular membrane, and terminated by a well-defined line at the elbow. The wound made by the operation was filled with an offensive sanies, and exhibited no tendency to healthy granulations.

“We threw in the cold lead injection, by fixing a pipe in the mouth of the subclavian, through the aorta: the shoulder and neck were minutely injected, but as the radial artery was not filled, the pipe was introduced into it, and the lead driven upwards until a portion was made to recede through the divided thoracic vessels.

“The arm, scapula, and clavicle, with a portion of the ribs, were separated from the body, and carefully dissected by Dr. Ashmead and myself, in the presence of the surgeons and house students. All the parts about the axilla were so blended by adhesions as to render their discrimination very difficult. The muscles were unaltered except from extravasation and effusion to be hereafter noticed. The subclavian artery was healthy, the vertebral of its usual caliber, the internal mammary large; the inferior thyroideal, the posterior cervical, and the superior scapular arose by a common trunk from the subclavian, together with an anomalous artery, about the size of a crow-quill, which descended, between the subclavian and carotid, along the trachea; its destination was not pursued. The posterior cervical was of the size of a large quill, having its branch to the base of the scapula much enlarged. The superior scapular artery ran along the upper edge of the subclavius muscle, and had escaped the operator’s knife, though it had been made visible by the incisions. It inosculated beneath the neck of the scapula with the inferior dorsalis scapulæ, which was the size of a crow-quill. From the unfavourable state of the part for dissection, we could not demonstrate the channels through which the blood to the arm passed, but that these existed, and would, under auspicious circumstances, have become adequate to the circulation, the course of the injection and other circumstances fully prove.

“As the injection from above had penetrated to the ligature, it is presumed that no coagulum had as yet formed. The ligature embraced the artery just where it emerges from beneath the scalenus anticus, and included no other part. The artery was uninjured, in all the space between the ligature and the point where it became adherent to the head of the bone, at the internal margin of the lesser tubercle. It was firmly attached to the substance of the bone and the articular capsule by dense cellular or ligamentous substance, and such was the compactness of this juncture, and so short the portion of artery between this point and that of its attachment to the rib, that it seemed absolutely impossible to reduce the bone to its place, and not cause the rupture of the vessel. This effect was here exhibited. Where the artery adhered to the bone, its internal coats had been ruptured, with the exception of a very narrow band immediately opposite to its point of attachment. The extremi-

ties of the artery had separated, as far as the band above alluded to would allow, (which was about half an inch,) and the artery, by tending to straighten itself, was only retained to the bone by the intervening portion of its external coat. The dilatation of the external coat had formed a sac, which was expanded by being stretched between the points of its attachment to the bone, and the ruptured extremity of the artery. This true aneurismal sac extended beneath the artery towards the ligature, and beneath the pectoralis minor muscle, but was ruptured in its posterior portion, very near its adhesion to the bone, so as to have allowed the blood to escape and form a diffused aneurism. The blood had penetrated beneath the pectoralis major and minor muscles, and along the edge of the latissimus dorsi as far as the seventh rib. It had extended beneath the humerus, to the space between the long head of the triceps and the teres minor, and had filled the axillary cavity, but had been prevented from extending downwards by the general agglutination of the parts, caused by the dislocation. Along the internal margin of the coracobrachialis and the deltoid there was much extravasation, but we rather think it was caused by the means used to reduce the bone.

"The walls of the true aneurismal sac were of so compact a texture, and its boundaries so well-defined, that the conjecture of its having existed previously to the reduction of the bone, and that its rupture was a distant and subsequent event, is rendered probable.

"Upon exposing the articular cavity, the head of the bone was found to rest beneath its original socket upon a bed of dense ligamentous substance. The capsule was much thickened, and had a rupture in its inferior anterior portion, through which the blood and injected matter had entered.

"About one-third of the lower portion of the glenoid cavity had been broken off, and remained attached to the superior part of the neck of the bone, by an adventitious adhesion.

"The greater tubercle of the humerus was cracked through its base, with the exception of the portion beneath its anterior facet. From the thickening of the periosteum, and the deposite of osseous matter, we do not think that this fracture was recent. The extremity of the acromion process was found fractured, but was still firmly embraced by the surrounding muscular and fibrous structure.

"It is proper to mention that the left ventricle of the heart was enlarged, and its muscular substance unusually soft. The right ventricle and auricles did not exhibit these phenomena. Upon opening that part of the subclavian embraced by the ligature, the internal coats of the vessel were found completely divided, but no traces of a coagulum could be observed above the ligature, nor was there any vestige of a coagulable lymph, or any approach to adhesion—though the ligature held its place with great tenacity, and the parts embraced by it seemed healthy.

"No other part was examined.

"JAMES C. HALL, M. D."

Remarks.—A second time has it fallen to my lot to witness rupture of the axillary artery, during the reduction of an old luxation of the humerus at the shoulder joint. The particulars of the first case, with remarks upon them, were formerly detailed in the seventh volume of the Philadelphia Journal of the Medical

and Physical Sciences. It was there stated that the practice advised by Desault, and followed by most European and American surgeons in cases of ancient luxations, was to employ extension and counter-extension to an almost unlimited degree, to rotate the limb in every direction, break up the adhesions and adventitious ligaments, and, in fact, to set no limits to violence and force rather than fail to restore the head of the bone to its original socket. With a view of illustrating this practice, emanating from a surgeon of almost unrivalled skill and reputation, the following quotation was made, and may be repeated in this place.

“Previously to making extension,” says Desault, “it is necessary to move the bone, *very forcibly*, in every direction, in order first to break the adhesions, to tear the condensed cellular membrane which serves as an accidental capsule, and to produce, so to speak, a second luxation with a view to make way for a perfect reduction of the first. The straps being then applied as in ordinary cases, serve the purpose of extension, for the accomplishment of which the number of assistants must be increased. Oftentimes the first efforts are fruitless, and the luxated head remains stationary amidst the *most violent efforts*. Let the extension then be discontinued. Renew the *forcible motions* of the limb; carry the humerus upwards, downwards, forwards and backwards; *force the resistances* to give way; make the arm describe a large arch of a circle round the place which it occupies; let the rotatory motions on its own axis be impressed on it anew; and then recommence the extensions and let them be made in every direction. By these the head, already disengaged by means of the preceding *violent motions*, will be brought to a level with the glenoid cavity, and ultimately replaced.”*

In addition it was stated, in the paper referred to, that Dr. Physick had, “in a variety of instances, succeeded after two and three months;” that the late Dr. Dorsey approved of Desault’s practice, and followed it successfully in several cases—that Dr. M’Kenzie, of Baltimore, replaced a dislocated os humeri, nearly *six months* after its dislocation—that the same had since been accomplished by Mr. Kirby of Dublin—and that I myself had repeatedly reduced luxations at the shoulder, and some other joints, from two to four months’ standing, and that though in several instances the adhesion surrounding the head of the bone, and the new socket, were so considerable as to require great force and extensive laceration, not the slightest accident had ever occurred. I took the opportunity at the same time, to remark, that there were very few cases on record, so far as could be ascertained, of injury, much less of death, result-

* Desault’s Works, by Caldwell, p. 144.

ing from the practice—that Desault had detailed the history of one case in which a large emphysematous, or bloody tumour, formed under the pectoral muscle immediately after the reduction was accomplished—that Sir Charles Bell had mentioned an instance of rupture of the axillary artery and muscles, during the use of an ambe, and that in consequence the surgeons were obliged to amputate on the spot—that David, surgeon of the Hôtel Dieu, at Rouen, had reduced, after violent efforts, a dislocation of several months' standing, and that the patient lost his life from mortification of the whole arm.

Since the publication of these statements, however, I have met with others, among writers, of a similar character. Pelletan, especially, in his *Clinique Chirurgicale*, alludes to several cases of the kind, and upon one of them makes the following remarks: "La tradition nous a conservé un fait de ce genre arrivé à l'Hôtel Dieu il y a à peu près vingt ans. On voulut réduire une luxation de l'humérus qui existait depuis quatre mois. Dans les violens efforts qui l'un fit pour y parvenir, il se fit un déchirement douloureux, et il s'éleva une tumeur volumineuse. On annonça que cette tumeur était emphysémateuse; mais des témoins oculaires m'ont rapporté que c'était une crevasse de l'artere et un épanchement de sang: on en fit l'ouverture, et le malade mourut d'hémorrhage."* In the eleventh volume of Johnson's *Medico-Chirurgical Review*,† there is a condensed account of several cases, "illustrative of the ill consequences which sometimes follow the reduction of dislocation," from the French of M. Flaubert.‡ The first case noticed is that of a stout sailor, of intemperate habits, and fifty-seven years of age, who entered the hospital of Rouen on the 13th. of March, 1824; in consequence of a forward luxation of the humerus which occurred eleven days before. On the same day the patient was admitted, an attempt was made by M. Leudet to replace the bone, in which, after two trials, he succeeded.

"An enormous swelling followed almost immediately beneath the pectoral muscle. The face became pale and covered with sweat, the lips livid,

* Tom. ii. p. 94.

† Page 452.

‡ *Memoires sur plusieurs cas de luxation, dans lesquels les efforts pour la réduction ont été suivies d'accidens graves.* Par M. Flaubert, chirurgien en chef de l'Hôtel Dieu de Rouen, in *Repertoire Général d'Anatomie et de Physiologie Pathologiques et de Clinique Chirurgicale*, &c. &c., premier trimestre, cinquième numéro, 1847.

and the pulsation in the radial artery ceased. 14th. The countenance was pale, the pulse small, hard, and frequent. The swelling seemed to have subsided a little, but the limb was cold and of a purplish colour. In the axilla was a tumour, the pulsations of which were distinct to the eye, though not to the touch. It was now evident that *the artery was ruptured*, but the state of the parts around precluded any operation for tying the subclavian. On the 17th, phlyctenæ appeared, and on the succeeding days, *gangrene* became developed. 25th. The fingers, elbow, skin of the axilla, and inside of the arm, are in a state of sphacelus; the pulsations of the tumour are more marked. 27th. A good deal of hemorrhage from two openings situated a little below the armpit. Though the bleeding was arrested, the patient expired in the course of an hour.

“*Dissection.*—Hand and inside of the arm in a state of gangrene. The *pectoralis major* was almost completely torn across, and its fibres were separated by clots of blood. The upper portion of the short head of the *biceps* was ruptured also. All the muscles of the arm, shoulder, and outside of the chest, were infiltrated with blood. Between the *pectoralis minor* and *latissimus dorsi* there was a large clot, on removing which *the axillary artery was found to be fairly torn across*, a little above the origin of the subscapular. In order to discover the upper end of the vessel, it was necessary to dissect the *subclavian*, which was enlarged, as were the branches which arise from it. The *axillary* artery lay beneath the *pectoralis minor* upon the rib, to which it adhered by means of coagulable lymph. The end of the vessel was narrowed, and the thoracic nerves flattened. The second rib was depressed, its periosteum slightly absorbed, and the bone itself a little rough. The head of the humerus was somewhat flattened at the part corresponding to the rib; the capsule was torn, the cartilage rough and ulcerated in parts. The inside margin of the *glenoid cavity* was fractured.”

In the second case of dislocation into the axilla, reported by Flaubert, there was reason to believe that the axillary plexus of nerves was injured by the attempts at reduction. In the third case, (also a dislocation into the axilla,) the axillary nerves were found upon dissection to have been torn from the spinal marrow. Another case is related by the same writer, in which the reduction of a dislocation of the forearm backwards, was followed by great irritation, syncope, loss of pulse, enormous swelling, from which the patient narrowly escaped. A fourth case of luxation of the shoulder, attended by consequences nearly similar to those last mentioned, is also reported, and a fifth, (that of luxation of the hip,) in which it was doubtful whether the patient's death was caused by the accident or by the means employed to reduce the bone. Flaubert concludes by remarking, that “*surgeons either say less than they might about their mishaps, or that he alone had been unlucky enough to meet with all these unfortunate accidents.*” At Guy's Hospital, in 1839, a preparation was shown to me by Sir Astley Cooper, in which the axillary artery

had been torn in an attempt to restore an old dislocation, where the patient was saved by Mr. Key, who took up the subclavian artery. Several additional cases, recorded by the older surgeons, or recently, have been mentioned to me by Dr. Norris.

It is not my intention to comment, except in a very brief way, upon the case of *Langton*. The particulars of it having been fairly and honestly stated, the profession will be able to draw its own conclusions. I may remark, however, that between the first accident of the kind I have detailed, and the second, (a period of five years,) I have reduced five luxations, each from two to four months' standing—one in a patient of Dr. D. T. Coxe, upwards of sixty years old—another of Dr. Manuel E. Robinson, about the same age, and three more in my own practice, besides several similar accidents of a recent kind—all of which terminated in the happiest manner.

From these, and from many other cases of a similar character which I have treated within the last twenty-eight years, I think I have good reason to conclude, that where no adhesion exists between the artery and surrounding parts, the operation may be done with safety; that on the contrary when adhesion does exist, (and of this we have no means to judge,) rupture of the vessel must be an inevitable consequence, whether the reduction be effected by force, or by the most gentle means. To show, however, that neither my colleagues, nor myself, made use of unwarrantable force in the case of *Langton*, I shall present the following documents, obligingly furnished by some of the gentlemen present at the reduction.

“My Dear Sir,

“I was present when you reduced the luxated humerus of John Langton, assisted by Drs. John R. Barton and Harlan, on Saturday, the 15th instant, at the Almshouse Infirmary.

“On that occasion, the force employed was much less than I have repeatedly witnessed in the reduction of ancient luxations, and less could not have been used with any probability of accomplishing the reduction. The force was *gradually applied and long continued*, with the intention, as you expressly remarked, to avoid the hazard of accident.

“I believe it to be very probable that the rupture of the axillary artery in the reduction of long standing luxations of the humerus, has occurred in more instances than the small number on record. But, unfortunately, surgeons and physicians have seldom the candour or independence to acknowledge their failures or the unfavourable results in their practice, while the successful cases are sedulously blazoned forth to the world. This custom is analogous to the *suppressio veritatis* of a witness before a jury, and should be regarded

as equally culpable, and leading to equally injurious consequences. A work exposing the hazards attendant on operations, and the dangers of active medicines, illustrated with apposite cases, is a desideratum in the science, the execution of which would confer a most important obligation on the profession.

“With great respect, yours, truly,

“Dr. William Gibson.

“SAMUEL JACKSON.

“March 22d, 1828.”

“Professor Gibson,

“*Dear Sir*—Having learned that you intend to publish the case of John Langton, I beg leave to express my pleasure at the disclosure of an event likely to be so salutary to the interests of surgery. The condition of the parts connected with the dislocation, was not evidenced by any external signs, at the time when the reduction was attempted, nor could it be reasonably conjectured by any thing which appeared. The force applied was not irregular, ill-directed, or such as could have done *any* injury in that state of parts which usually follow a dislocation of the os humeri. The unexpected result arose out of circumstances beyond your control and insusceptible of detection: had it been otherwise, I feel assured that your surgical tact and cultivated skill would have discerned the lurking evil, and provided against the consequences.

“Very respectfully, your obedient servant,

“J. K. MITCHELL.

“Philadelphia, March 28th, 1828.”

“We, the resident students of the Philadelphia Almshouse Infirmary, certify, that as far as we are capable of judging, the utmost skill and prudence were exercised in the reduction of the above luxation.

“The patient was bled, purged, and kept on barley-water alone for four or five days previous to the operation. About one hour and three-quarters were taken up in the attempts at reduction: during this time he was bled copiously, took large doses of tartarized antimony—was placed in every position which could promote success—and extension and counter-extension were made in the most gradual manner. The rotatory motions, necessary for breaking up the adhesions, were also made with the greatest caution.

(Signed)

HENRY S. LEVERT, M. D.

J. C. NOTT, M. D.

JOHN B. TUFT, M. D.

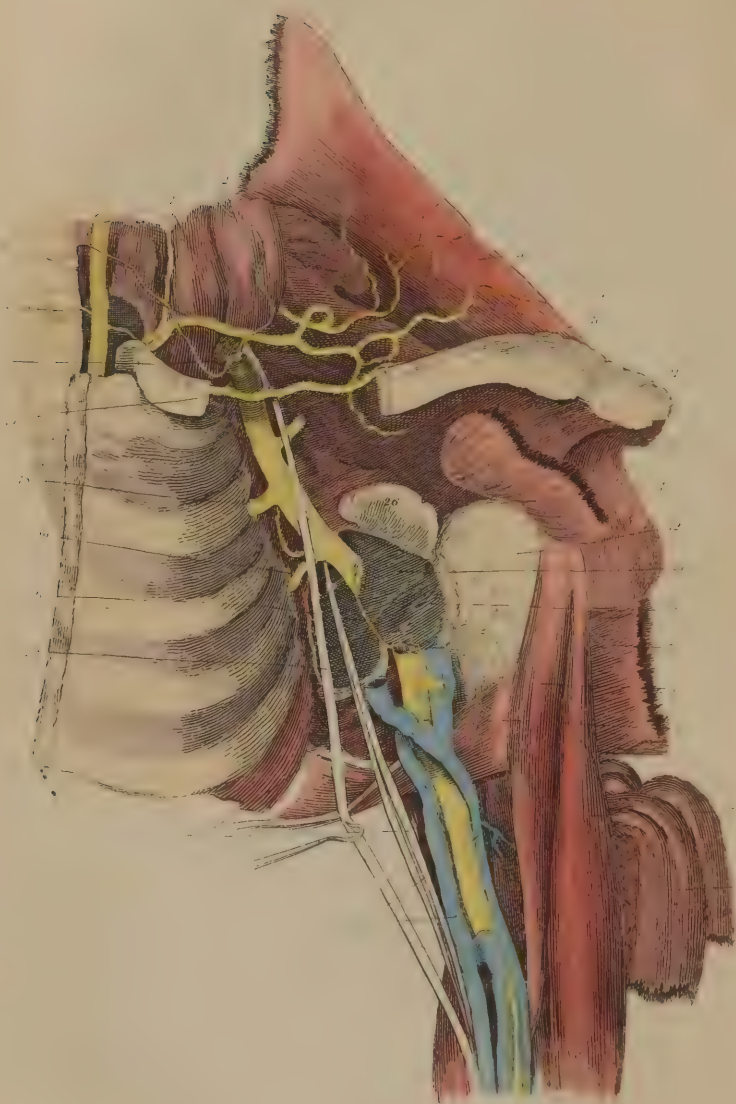
E. R. CHEW,

GEO. S. BETTNER, M. D.

JOS. PEACE, M. D.”

WILLIAM ASHMEAD, M. D.

My former paper on rupture of the axillary artery was concluded in these words: “A question may possibly arise—whether surgeons should be influenced by the event of the case I have detailed, and by those I have quoted, and deterred altogether from attempting reduction in dislocations of long standing, or whether the established practice should still be continued, unaffected by fortuitous circumstances or contingencies neither to be foreseen or controlled? To the latter proposition I have no hesitation to give unqualified assent, and to declare, that



should a case similar in appearance to that of James Scofield again occur, I shall feel justified in adopting a similar course.” Such a case has occurred, but unfortunately with a result that could scarcely have been anticipated, either by myself or coadjutors. If the question were again presented, I should answer it, I think, in the following way. If the patient is young, not very muscular, the luxation not complicated with fracture—if no attempts have previously been made to accomplish the reduction, and the head of the bone has not been out of its natural situation beyond five or six weeks, I should advise the attempt to *replace* it. But, on the contrary, if the patient is very robust and vigorous, advanced in years, accustomed to labour and to the free use of ardent spirits, and the head of the bone has been long out, I should discountenance any attempt at reduction. In conclusion, I shall merely observe, that the fractures of the acromion process, of the greater tubercle of the humerus, and of the lower portion of the glenoid cavity occurred, in all probability, either at the time of the accident, or during the attempts made in the country to reduce the bone—and that the snap so distinctly heard the moment before the head of the bone was restored to its socket, arose, beyond doubt, from the lower fragment of the glenoid cavity being but imperfectly united and broken up again by the extension and counter-extension.

EXPLANATION OF THE PLATES.

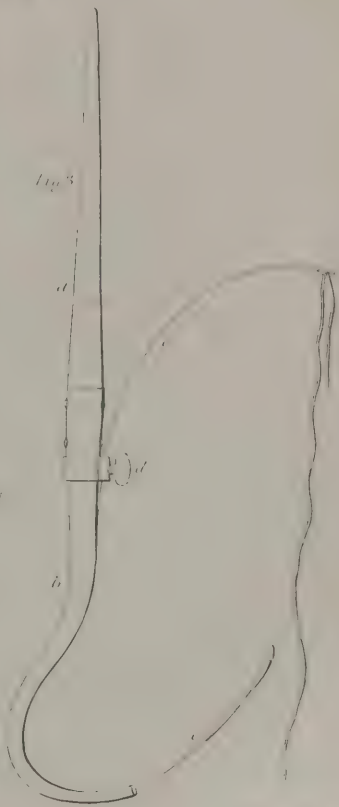
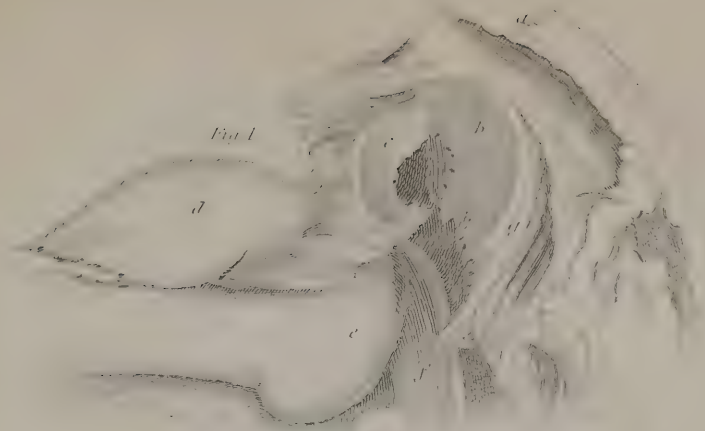
- Pl. XVI. 1. *Scalenus anticus*.
 2. *Scalenus medius*.
 3. *Trapezius*.
 4. *Pectoralis minor*.
 5. *Pectoralis major* drawn from beneath the biceps.
 6. *Coraco-brachialis*.
 7. *Biceps*.
 8. *Deltoid*.
 9. Tendon of the *latissimus dorsi*.
 10. Clavicle, a portion of, removed.
 11. Acromion.
 12. Head of the humerus out of its socket.
 13. Glenoid cavity of the scapula.
 14. Subclavian artery, coming from beneath the scalenus muscles with the ligature around it.
 15. Inferior thyroid artery.
 16. Posterior cervical.
 17. Superior scapular.

18. External mammary.
 19. Subscapular.
 20. Band formed by remaining portion of the two internal coats of the artery, and connecting the divided extremities of the vessel.
 21. Cavity of the aneurism.
 22. Anterior part of the aneurism.
 23. Rupture of the sac.
 24. Basilic vein and *venæ comites*.
 25. Brachial nerves.
 26. Part of the sac turned upwards.
- Pl. XVII. Fig. 1. *a.* Acromion process of scapula, with fissures through it.
b. Glenoid cavity.
c. Inferior part of the glenoid cavity broken off, and attached by a ligament to the upper part of the neck of the humerus.
d. Greater tubercle of humerus fractured through its base.
e. Head of the humerus.
f. New socket in which the head of the humerus rested.
g. Part of capsule of the articulation.
- Fig. 2. Improved cannula with its stilet—Perspective view.
- Fig. 3. Side view.
- a.* Handle.
 - b.* Silver cannula.
 - c.* Stilet, formed of watch-spring, with an eye at one end through which a ligature is passed, and with a silver head at the other, made to fit accurately to the end of the silver cannula. The needle is pushed some distance through the blade so as to give a better view of it.
 - d.* Screw by which the stilet is retained firm in its place.

The conclusions which I am *now* prepared to draw (from the result of the cases of Scofield and Langton, from those reported by Flaubert, and from other communications to me within the last few years,) are directly the reverse of what I have stated in some of the foregoing pages; I am now disposed to condemn, in the most unqualified terms, all attempts at restoration of *ancient* luxations of the humerus and other bones—except in cases where the patient is remarkably thin and debilitated, and where there has been little or no inflammation at the time or subsequent to the displacement.

A very interesting inaugural essay* was published at Berlin

* *Luxationes experimentis illustrate. Dissertatio inauguralis quam consensu gratiosi medicorum ordinis Basiliensis pro summis in Medicina et Chirurgia honoribus rite impetrandis scripsit Ludovicus De Wette, Basiliensis. Berolini MDCCCXXXV.*



in 1835 by Dr. De Wette, in which the result of numerous experiments upon animals is detailed, calculated to show that the most serious consequences must, in many cases, result from adhesions between arteries and other textures. Dr. De Wette, whom I had the pleasure to see in this country four or five years ago, concludes his essay in these words. "*Quam maxime optandum est, ut omnes chirurgi hoc sibi muneris imponant, ut, si quid hac in materie experti sint, eodem hoc veritatis studio, quo Gibson et Flaubert, cum medicis communicent.*"

Two cases of old luxations of the shoulder, one in a mulatto woman of thirty-five years of age, the other in a man of forty, presented themselves at the Philadelphia Hospital during the winter of 1835. The head of the humerus appeared in each case to have formed very close adhesions with the surrounding parts, and as the luxations had been of several months' duration, and had been followed originally by a good deal of inflammation, I declined attempting reduction, and should observe the same rule in all similar cases.

I have only further to add on this important subject, that for several years past I have been accustomed to state in my lectures, that it might become a question whether it would not be proper, in certain cases of *old* luxations, to remove the adhesions by the *knife*, previous to attempting reduction.

To reduce a luxation of the shoulder *forwards*, the elbow should be directed backwards, and the arm drawn downwards as close to the side as possible. Counter-extension may be made in the usual way or by the heel in the axilla.

In luxation *backwards*, the arm must be elevated above the head; this will have a tendency to carry the ball of the humerus downwards and disengage it from the dorsum scapulæ, from which it will slip into the axilla, and may afterwards be reduced according to the directions already given for the management of dislocations in the axilla.

This plan at least has been recommended by Sir Astley Cooper. From an interesting letter, however, which I received in September, 1831, from Dr. George Snider, a respectable practitioner of Jackson, in Tennessee, detailing a case of dislocation on the dorsum scapulæ, it appears that elevation of the arm above the head does not always succeed in reducing a bone.

"On the 7th of June," says Dr. Snider, "my colleague, Dr. James Young, was requested to visit Washington, aged twenty-

five years, the slave of Mr. A. P., of this place, who was represented to have received a severe injury of the right shoulder by being precipitated from a cart, when at full speed. Dr. Y., on reaching the place where the accident happened, discovered that a dislocation had taken place—Washington was directed to be conveyed to his master's house, a distance of three or four hundred yards, when I saw him in conjunction with Dr. Y. Though the distance was but short, and a very few minutes had elapsed from the time of receiving the injury until he was brought home, the swelling was found to have increased very much, and he complained of intense pain whenever the shoulder was moved. Upon an examination, a depression was observed beneath the acromion, and the head of the bone found resting on the dorsum of the scapula, below the spine, the arm approximated to the chest, with the forearm thrown across it.

“Reduction was attempted in the manner recommended by you, by elevating the arm above the head, with the view of disengaging the head of the bone from the dorsum scapulæ, and throwing it into the axilla—we were unable after two trials to effect the reduction in this way. The bandages were then applied in the usual way for dislocation into the axilla, and the reduction accomplished—to our great satisfaction—with perfect ease. We are inclined to think that had we succeeded in throwing the head of the bone into the axilla, the difficulty of reduction would have been increased, on account of the rent in the capsular ligament not corresponding with the position of the head of the bone.”

In many cases of recent and old luxations, it happens that the head of the bone does not immediately fill up, after reduction, the glenoid cavity; and the surgeon, supposing that he has not succeeded in restoring it, continues his efforts. The late Dr. Physick was accustomed to explain this deception, by stating that the deltoid was *paralyzed* and did not act for some time afterwards.

SECTION IV.

LUXATION OF THE FOREARM.

FROM an examination of the structure of the elbow joint, it might be supposed that luxation could scarcely happen in any direction. There is one direction, however, in which it is exceedingly frequent—*upwards* and *backwards* of both bones of the forearm. *Laterally*, luxation is very uncommon, and anteriorly can hardly occur without a previous fracture of the olecranon process.

The luxation *upwards* and *backwards* is generally produced by a fall, in which the patient extends his arm to save the body, and receives the whole shock upon the palm of the hand. A tumour, formed at the bend of the arm, by the condyles of the humerus, and covered by the brachialis internus and biceps muscles in a state of violent distention, by the contraction of which the forearm is kept in a state of semiflexion, and a large protuberance on the back of the elbow produced by the unnatural projection of the olecranon, will be sufficient to point out the precise nature of the injury.

Lateral luxations of the elbow may be known by the internal or external displacement of the bones composing the joint, or in other words by the peculiar deformity attending each variety of the accident. The luxation *anteriorly*, should it ever occur,* independently of fracture of the olecranon, may be easily recognised by the posterior projection of the condyles of the humerus, the extended position of the forearm, and the prominence of the coronoid process at the bend of the arm.

Besides luxation of *both* bones of the forearm from the humerus, the *upper* and *lower* extremities of the radius and ulna may be separated from each other. The direction of displacement of the *upper* extremity of the *radius* may be either *backwards* or *forwards*. The former is the most frequent, and is commonly produced by inordinate action of the pronator muscles, the effect of which is to dislodge the bone from the lesser sigmoid cavity of the ulna and place it on the outside of the

*One case of the kind is recorded by Delpech.

olecranon, where it may be distinctly felt forming a considerable eminence; at the same time the hand is fixed in a state of pronation. In luxation of the radius *forwards*, which is extremely rare, the hand will be found in a state of supination, and the head of the radius may be felt projecting at the bend of the arm.

According to Sir Astley Cooper, luxation of the upper extremity of the radius *backwards* is a very uncommon accident, and luxation *forwards* the most frequent of the two. This statement, I am very sure, however, is entirely unfounded; indeed, I have always looked upon it either as a typographical error, or as introduced inadvertently by Sir Astley into his work. But in a conversation held between Sir Astley and myself on this subject, in London, in 1839, he maintained the correctness of the opinion advanced in his work, and stated that the case to which he particularly referred, had been seen by his nephew, Mr. Bransby Cooper, and by Mr. Guthrie. Both these gentlemen, afterwards informed me, that they concurred with me in opinion, and had always believed Sir Astley in error on that subject. There are, however, it is proper to state, other eminent surgeons,—among the rest, Mr. Liston,—who contend that luxation forwards of the upper end of the radius is a more common accident than that backwards. I myself have seen several examples of luxation of the radius backwards, and in particular I had an opportunity of exhibiting to the class, in the winter of 1826, a case in which both radii were luxated at the same moment, from the patient being precipitated suddenly before a hogshead of sugar, whilst in the act of rolling it. Boyer says that “the upper extremity of the radius can only be luxated backwards;” and Desault remarks, on the other hand, that he himself had never met with the accident at all in either direction.

The *lower* extremity of the *ulna* sometimes abandons the sigmoid cavity of the radius and projects *posteriorly*. At other times, though rarely, it is pushed *forwards*. In the former case the hand is in a state of pronation, and the end of the ulna is felt behind the radius; in the latter the ulna projects on the front of the wrist and the hand is fixed in a painful state of supination. I have met with three examples, only, of this luxation. One occurred in a medical student,—Mr. D. of North Carolina,—in the winter of 1828; another in a negro girl, from

a blow on the back of the ulna with a file, and the third happened to myself when a boy.

TREATMENT OF LUXATION OF THE FOREARM.

There are several modes of reducing the dislocation upwards and backwards of both bones of the forearm at the elbow joint, but I prefer the following. The patient should be seated on a chair, while the surgeon, placing his knee in the bend of the arm, makes counter-extension, and extension by grasping the forearm just above the wrist; at the same time the forearm is bent nearly at a right angle upon the arm. This plan seldom fails, and the bones return to their places with an audible snap. The forearm should afterwards be carried across the chest and sustained by a sling, or, by way of additional security, may be surrounded by splints and kept still for a week or ten days. *Old* luxations of the elbow, or those which have existed beyond three or four months, can seldom be reduced. The experiment I have tried again and again, both in young and old subjects, but never with complete success; nor is it likely that extension and counter-extension will answer the purpose after the lapse of a few weeks, if Cruveilhier's statement be correct—that masses of bony matter are thrown out, generally around the joint, and consolidate the radius, ulna, and condyles. Two interesting cases under care of Dr. Horner, in which I was consulted in 1840, proved irreducible, notwithstanding the force employed to overcome the resistance. Successful cases have, however, been reported by some modern surgeons. Should the resistance seem to depend upon the *ligaments*, in any difficult case of the kind, and there were no adhesions or bony formations to contraindicate the measure, I should have no hesitation to divide the ligaments with a couching needle or narrow bistoury—taking care to disturb the joint as little as possible. To reduce a *lateral* luxation of the elbow, Sir A. Cooper recommends forcible extension of the arm in order to oblige the tendons of the brachialis internus and biceps muscles, which are stretched over the condyles of the humerus, to act upon the principle of the string of a pulley, and drag the bones into their places.

To reduce a *backward* luxation of the upper end of the *radius*, nothing more is necessary than for the surgeon to force the pa-

tient's forearm with one hand towards supination, and with the other to push the head of the radius from behind forwards. By these simultaneous efforts, the bone suddenly starts into its place, and the deformity and other symptoms instantly disappear. Luxation of the same bone *forwards*, must be treated upon the same principles, but the force should be exerted in an opposite direction.

Luxation of the *lower* extremity of the *ulna* is commonly reduced without difficulty. When displaced in a *backward* direction, the hand should be gradually but forcibly extended and moved laterally until restored to its supine position. A slight pressure on the head of the bone will then be sufficient to replace it. In luxation *forwards* the hand must be carried downwards, or in the direction of the state of pronation.



SECTION V.

LUXATION OF THE HAND.

UNDER this division may be included dislocations of the wrist, of the carpal and metacarpal bones, and those of the fingers and thumb. None of these injuries are very common, and when they do occur, are generally accompanied with wounds and fractures, produced by heavy weights or by the bursting of a gun. The radius may be merely dislocated, however, from the carpal bones, either in an anterior, posterior, or lateral direction. In all these cases, the most common cause of the accident is a fall upon the palm, back, or edges of the hand.

An anterior luxation may be known by the projection of the carpus in front of the wrist, by the tension of the flexor muscles, and the extended position of the hand. A posterior luxation, on the contrary, will be characterized by the flexed position of the hand, by a protuberance of the back of the wrist, and by the tension of the extensor muscles. Lateral luxations are easily distinguished by the projection or deformity at the radial or

cubital edges of the wrist. According to Dupuytren, the greater number of cases reported as luxations of the wrist are, in reality, fractures of the radius or ulna.

The *carpal* bones are so firmly connected to each other by short ligaments and by a ball and socket joint, as to be scarcely susceptible of luxation. Instances, however, are now and then met with, of displacement of the *os magnum* and *os cuneiforme*, either from violence or from extreme relaxation of their ligaments. The *metacarpal* bones are, perhaps, never luxated, except by a gun-shot wound or some similar violence.

The *fingers*, from their mobility and the strength of the ligaments and tendons surrounding them, are very seldom luxated. Indeed, except in a backward direction, owing to the peculiar conformation of the articulating surfaces, a dislocation would seem almost impossible. The *thumb*, however, is not unfrequently luxated, either at the articulation of the metacarpal bone with the trapezium, or at the junction of the first or second phalanx. Dislocation of the first phalanx from the metacarpal bone is the most common, and may be known by the projection of the latter inwards, or towards the palm of the hand, while the former is mounted upon the metacarpal bone, and forms a considerable eminence backwards.

TREATMENT OF LUXATION OF THE HAND.

Luxations of the lower extremity of the radius, whether in an anterior, posterior, or lateral direction, must be treated upon the same principles—by extension, counter-extension and pressure on the protruded bone, and by bandages and splints after the reduction is accomplished.

To restore a displaced *os magnum* or *cuneiforme*, will often be found very difficult; and to retain them fixed in their natural situation still more so, especially when the luxation proceeds from relaxation of the ligaments. Well directed pressure and an appropriate bandage, are the only remedies.

Strange as it may seem, the dislocated thumb sometimes remains irreducible in spite of the most powerful efforts the surgeon can make. Instances, indeed, are not wanting, of the thumb being dragged off during violent efforts to reduce it. These difficulties may probably be traced to the common prac-

tice of making the extension in a straight line, (by which the heads of the bones are wedged into each other,) instead of bending the dislocated bone downwards in a semicircular sweep. Should the mere manual efforts of the surgeon prove insufficient, a piece of tape doubled into the form of "the clove hitch," or sailor's knot, may be secured to the thumb, previously covered with a piece of buckskin, and a greater degree of force exerted, but still in the direction recommended—downwards or towards the palm of the hand. If this treatment also fail, the surgeon must not, like Sir A. Cooper, despair of success, and under the idea that "the patient will have a very useful thumb after a time even without reduction,"* abandon all other resources, but promptly execute the ingenious and efficient plan of Sir Charles Bell†—the division of one of the lateral ligaments by the oblique insertion of a couching needle. This operation I have frequently performed with success. Liston reports similar results in his own practice.

Luxation of the fingers should be managed in every respect like that of the thumb. One or more *toes* are sometimes dislocated by the relaxation of their tendons, and become very much deformed, and so inconvenient to the patient by impeding his walking, as frequently to require amputation. In three or four instances of the kind, I have performed the operation on this account, and with complete success. To relieve this deformity, Boyer,‡ instead of amputation, has proposed the removal of a portion of the extensor tendon belonging to the deformed toe, and relates two cases in which the operation proved effectual.

* See Cooper on Dislocations, &c. 4to. p. 533.

† See Operative Surgery, vol. ii. p. 261.

‡ Treatise on Surgical Diseases, vol. ii. p. 384.

SECTION VI.

LUXATION OF THE THIGH AND PELVIS.

THE thigh bone is more subject to fracture than dislocation, though the latter is by no means uncommon. It may take place in four directions—upwards and outwards on the dorsum of the ilium, downwards and inwards into the foramen ovale, upwards and forwards on the pubes, and backwards into the ischiatic notch. The first two are the most frequent, and the latter extremely rare. To these a fifth has been added lately—a dislocation behind the tuber ischii. Luxation of both thighs at the same moment sometimes occurs. An interesting case of the kind was reported two or three years ago in one of the European Journals.

Luxation *upwards* and *outwards*, is generally produced by a fall upon the foot or knee, while the thigh is directed forwards and obliquely inwards. The round ligament and the upper portion of the capsular being torn, the head of the bone escapes, and lodges first upon the convex surface of the ilium, but soon changes its position and sinks into the external iliac fossa, where it afterwards remains. A prominence near the superior spinous process of the ilium, formed by the great trochanter, together with a shortening of the limb two or three inches, and an inclination of the foot inwards, are sufficiently characteristic of the nature of the accident.

Luxation of the femur *downwards* and *inwards*, differs materially from the foregoing. The limb is *lengthened* by two or three inches, the foot turned *outwards*, the great trochanter removed from the superior spinous process of the ilium, and the head of the bone, especially in thin subjects, distinctly felt at the foramen ovale, or upper part of the thigh. This accident is produced by a forcible abduction of the thigh, or by violence applied while the thighs are extensively separated from each other. The round as well as the capsular, ligament is generally torn, and the head of the bone rests upon the obturator externus muscle.

Although luxation on the *pubes* is seldom met with, the exact situation of the head of the bone, and the manner in which the

accident is produced, are well known. A hard tumour may be felt above Poupart's ligament, on the outside of the femoral vessels; the limb is shortened about an inch; the foot is turned outwards, and the trochanter major placed in front of the anterior superior spinous process of the ilium. This species of luxation must invariably happen from force applied while the limb is carried backwards and fixed, and from the body being at the same time thrown off its balance and directed backwards. Dr. Physick* once met with a case of luxation of the femur on the pubes, in which the affected limb, instead of being shorter, was somewhat longer than the sound one.

When the head of the os femoris is forced backwards and lodged in the ischiatic notch, the limb will be found shorter by half an inch than that of the opposite side, and the foot slightly inclined inwards. Owing to the depth of the notch, the head of the bone can seldom be felt. To produce this variety of luxation, the force should be applied while the thigh is bent upon the abdomen, or the body is thrown forward upon the thigh.

A luxation behind the tuberosity of the ischium is, of course, a very rare accident. It may be either primitive or consecutive. An instance of the latter kind was reported some years ago, by Mr. Keate, where a patient who, from being thrown from his horse, had the head of the thigh bone forced into the foramen ovale, and afterwards—from desperate exertions to escape from the pressure of the animal which lay over him—behind the tuber ischii. The limb was found lengthened and turned outwards. In the London Medical Gazette for 1836, a primitive luxation of this description is recorded by Mr. Wormald. It occurred in a maniac, who sprang from a third story window, and died soon after. The head of the bone, upon dissection, was found under the outer edge of the gluteus maximus, projecting through the torn capsule opposite the upper part of the tuber ischii, the gluteus medius and minimus, as well as the gemelli and pyramidalis, were more or less torn, the shaft of the femur lay across the pubes, and was firmly fixed, and the limb considerably shortened and turned inwards.

Under the name of *congenital* dislocation of the thigh bone, a peculiar affection has been described by Paletta, Delpech, Dupuytren, Cruveilhier, and other surgeons. From want of apparent depth or proper conformation of the acetabula, the

*Dorsey's Surgery, vol. i. p. 271.

heads of the thigh bones are carried upwards on the *dorsum ilii*, the limbs are shortened, the trochanters project, the toes are turned inwards as well as the knees and ankles, the muscles about the top of the thigh are gathered into bunches and form a cone, the apex of which is conspicuous at the trochanters. Such persons possess very little power of rotation and abduction, are awkward and ungainly in movement, and their thighs and legs so small, attenuated and short, as not to belong, apparently, to the same body. The pelvis is unusually wide, and rests nearly in a horizontal line upon the thigh bones. When examined in the recumbent posture, and especially when lying on the back, few or no marks of deformity exist; but the lower extremities may be shortened or lengthened at pleasure, several inches, without pain, or the slightest inconvenience. Females are much more subject to this affection than males; both acetabula, moreover, are commonly involved; and in a few rare instances the deformity exists merely on one side. According to Dupuytren, persons thus congenitally affected, run and jump with much greater facility than they walk, and with comparatively little of the waddling, sailor-like, shuffling gait, so conspicuous in their slow movements.

Voluntary dislocation of the *os femoris* is occasionally met with. An extraordinary instance of the kind was communicated to Sir Astley Cooper by Mr. Brindley, of Wink Hill, in a man of fifty, who could throw out the head of the bone from the acetabulum whenever he pleased, and reduce it with equal facility. A similar case is reported by Professor Cooper, and a third related in an inaugural essay by Dr. Lewis, of North Carolina, who graduated in our University in the spring of 1841.

TREATMENT OF LUXATION OF THE THIGH AND PELVIS.

The muscles surrounding the hip and thigh bone are so large and powerful that the surgeon must expect to encounter very considerable resistance in his efforts towards reduction. Whatever may happen to be the direction of displacement, with little variation, the same means must be employed. In addition to the general treatment formerly recommended for all luxations, and which will be found particularly necessary in luxations of the thigh, very powerful but gradual and long-continued exten-

sion and counter-extension must be resorted to as soon after the accident as possible.

The patient being stretched upon a table, covered with a mattress or blanket, the middle of a large sheet, folded diagonally, is placed in the perineum of the sound side, and its twisted ends, carried before and behind the pelvis, along the body and beyond the shoulders of the patient, are secured to a post, a staple in the wall, or to any unyielding fixture. Another sheet, folded in a similar way, is fixed upon the spine of the ilium of the injured side, and its ends being carried across the pelvis, are given in charge to one or more assistants. Lastly, a piece of buckskin is applied to the injured limb, either above or below the knee; over this is placed the centre of two towels, one on the outside, the other on the inside, parallel with the limb, to which they are secured by several turns of a wet roller. The four ends of the towels are tied together, and in the loop thus formed the hook of a pulley is fixed, and its opposite end fastened to a staple in the wall.

Every thing being arranged, the assistant having charge of the pulley is directed to set it in motion, and keep up a very gradual extension, while the assistants holding the transverse sheet, which is intended to fix the pelvis and prevent it from descending, keep it tense: the surgeon at the same time taking hold of the leg with both hands, bends it upon the thigh nearly at a right angle, and rotates it in different directions.

By continuing these efforts gradually and for a considerable length of time—in some instances two or three hours—we can scarcely fail to restore the head of the bone, provided it has not been displaced for many weeks or months, in which case success will hardly be possible under any treatment.

It must be particularly remembered—that the *direction* of the extension and counter-extension should *vary* according to the direction of the displacement or the variety of luxation that may happen to exist. In some cases it may be found necessary to place the counter-extending band in the perineum of the *injured* side, but in general the mode recommended should be preferred, inasmuch as the muscles about the dislocated bone are thus left free, and will not be stimulated to resistance.

One thing should never be forgotten, as regards attempts to restore luxations of the hip—the possibility of *fracturing* the neck or shaft of the bone by inordinate force. Such a case oc-

curred in the hands of the late Dr. Physick, many years ago at the Pennsylvania Hospital, whilst engaged in reducing by the pulleys a luxated hip—from exerting too much force upon the thigh in a lateral direction by an additional pulley. A similar accident is supposed to have happened in the same Institution, in 1838, to Drs. Harris and Randolph, whilst using the pulleys upon a boy twelve years of age; for, during extension and counter-extension, at the moment of rotating the limb and of drawing it forcibly outwards by a towel, a sudden crack was heard.

Luxation of the bones composing the *pelvis*, is rather a possible than probable occurrence, and on this account is seldom particularly noticed by systematic writers. The remark is peculiarly applicable to dislocation of the *sacro-iliac symphysis*. An accident of this description, however, having occurred in my practice during the winter of 1827, I insert the particulars of the case in this place as drawn up by Dr. Harris of the navy.

“Mrs. ———, the subject of this case, is thirty-five years of age, of a slender and delicate form, and the mother of a child, which, at the time of the accident, was two years old. On the 27th of January, 1827, she received a violent blow on her sacrum inflicted by her husband with his clenched fist. She immediately fell and was unable to rise. Severe pain was felt about the right sacro-iliac junction, accompanied with nausea and faintness.

“Dr. Gibson, Professor of Surgery in the University of Pennsylvania, was consulted a few hours after the occurrence of the accident. Upon examination, he found a considerable hollow over the upper part of the sacrum, produced by the unnatural backward projection of the posterior superior spinous process of the ilium. When the patient moved her right leg, an aggravation of the pain was experienced, accompanied by a distinct crepitation. The slightest motion conveyed an impression to her, as if, to use her own language, her “hip bones were separating.” These symptoms satisfied Dr. Gibson that a dislocation, or *diastasis* of the sacro-iliac symphysis had taken place. The patient was bled and directed to take an anodyne draught, and a soap plaster was applied over the injury.

“*Jan. 28th.* Passed a restless night—pain continues acute, and a burning sensation is felt in the site of the dislocation. Her

bladder and intestines continue to perform their natural functions; thus affording satisfactory evidence, that no material mischief has been done to the spinal marrow.

“In consequence of Professor Gibson’s numerous engagements he was unable to continue his visits to the patient, particularly as she lived at an inconvenient distance. He therefore very kindly placed the patient under my charge.

“*Feb. 1st.* In addition to the symptoms already detailed, I find, upon lifting the soap plaster, a considerable ecchymosis over the injured articulation.

“*Feb. 3d.* Complains of creeping rigors, which extend from the lower part of the sacrum to the middle of the dorsal vertebræ. The slightest motion produces a recurrence of the chills, and aggravation of the pain. While, however, the patient continues to lie on her left side in a state of perfect quietude, her sufferings are much less severe than they were during the first four days: any other position occasions great pain. No material alteration in the symptoms was observed until

“*Feb. 10th.* Experiences acute lancinating pain about the right sacro-iliac junction, accompanied with some fever and restlessness. The partial rigors are less frequent. A dose of oleum ricini was prescribed, which operated freely, and procured relief from the pain and fever.

“*Feb. 12th.* No fever, and while perfectly quiet, exempt from pain. Applied a roller around the pelvis, which affords her, as she states, comfortable sensations.

“*Feb. 14.* Patient complains that the bandage around the pelvis excites uneasiness. It was in consequence removed, and a fresh soap plaster applied.

“*Feb. 16th.* Severe pain is felt in the right knee similar to that which arises sympathetically from diseased hip joint. The chilly sensation in the course of the spine, has not been felt since yesterday morning.

“*Feb. 20th.* Pain continues in the knee, but in other respects more comfortable. Accidentally moved her right leg this morning, but without producing crepitation, or much pain.

“*Feb. 25th.* No pain is felt in the knee, and the patient says she feels in every respect much relieved. Applied a padded and quilted girdle around the pelvis, which was secured by a lacing cord. She is now allowed to indulge in her ordinary diet.

“March 8th. An attempt was made to-day to raise the patient in bed; but as it produced an aching sensation in the injured part, she was immediately replaced in her former position.

“March 14th. Perfectly free from pain. Another attempt was made to raise the shoulders in bed, which produced less inconvenience. Remained in this situation twenty minutes, when she complained of fatigue.

“March 16th. Was again raised in bed, and continued in this situation for half an hour without suffering much uneasiness. From this date she was raised every day to a semi-recumbent position, and so continued during the space of an hour until

“March 30th. Was lifted to-day from bed, but in consequence in part at least of the debility of her muscles, was unable to stand. Directed that she should be placed every day in a cushioned arm-chair.

“April 10th. With a little assistance, stood to-day for three or four minutes.

“April 15th. Aided by a cane, she walked from the chair to the bed.

“April 20th. Walked across the room without any assistance, but with some difficulty.

“April 27th. Walking considerably improved. The patient now feels but little inconvenience from the injury.

“May 4th. Walked down and up stairs. The posterior projection of the ilium, and the corresponding depression of the sacrum are still very apparent. The latter bone appears to have been forced inwards about half an inch. The great breadth of this articulation, or synchondrosis, will allow of a displacement to this extent; and still there will remain opposed to each other surfaces of sufficient width to sustain, when properly united, the weight of the body.

“Considering the firmness of the union between the sacrum and ilium, supported as it is by powerful ligaments, it would seem almost impossible, that a blow with the fist could separate them. It may be well to state, however, that the individual who inflicted the injury, possessed great muscular strength, that the patient was delicately formed, and that, in this particular case, there may have been an unnatural weakness of the articulation. Whether this local weakness had always existed, or whether it had been superinduced during some particular

derangement of the system, is altogether a matter of conjecture. That relaxation, and even partial separation of the pelvic articulations do sometimes take place during pregnancy, is fully established by the testimony of Ambrose Paré, Petit, L'Heretier, Boyer and others. Their opinions upon this point are not the result of speculations, but founded upon satisfactory post-mortem examinations. In some instances, these bones were reunited, and in others, they continued separated, and the unfortunate patient was in consequence, bed-ridden for life. If the reports of these distinguished surgeons be correct, it will not be unreasonable to suppose, that our patient may have experienced during her last and only pregnancy, this partial relaxation of the sacro-iliac symphysis, which may have been increased by the severe and protracted accouchement, which she reports herself to have then experienced. Though a considerable time had elapsed from the period of her delivery to the occurrence of the accident, still it may not have been sufficient to restore the synchondrosis to its original strength. It is only by admitting this supposition, that we can account for the production of an injury, by means apparently so inadequate. This is so rare an accident, that some surgeons have doubted the possibility of its occurrence under any circumstances unless in connexion with fracture of the pelvis, or concussion of the spinal marrow. The degree of external violence required to produce such an effect, does at the same time so much injury to the spinal chord and pelvic viscera, as to render the dislocation the most simple part of the case. When the accident is thus complicated, it always sooner or later terminates fatally. Cases of this character are recorded by Boyer, Astley Cooper and others. The only case of *simple* dislocation of the sacro-iliac synchondrosis which I have been able to find, besides the one now recorded, was reported by Eneaux, Hoin, and Professor Chaussier, and published in the *Reçueil des Mémoires l'Académie des Sciences de Dijon*. As I have not at present access to this work, I will subjoin the following extract from their report, which may be found in the fourth volume of Boyer's Surgery. 'The left os innominatum was dislocated and displaced upwards. The inflammatory condition of the part forbade all attempts at reduction. After using for several days relaxing applications, and an antiphlogistic regimen, an attempt was made to replace the bones, which was opposed by a recurrence of the

pain, and followed by a return of the inflammatory symptoms. After some days, we renewed the attempt at reduction, but with the same result, when it was determined to renounce all further efforts. After a prolonged rest, but shorter than could have been desired, the patient left his bed; and having commenced walking, with the assistance of crutches, the weight of the limb corresponding with the injured side, drew the displaced ilium downwards, and thus gradually effected a reduction. The patient ultimately recovered, and was enabled to resume his employment as a bricklayer.' It is not settled, either in what manner the accident occurred, or what length of time was required to accomplish the restoration."*

Two very interesting cases of dislocation of the os innominatum on the sacrum, have been published recently by Lenoir, as having occurred in the wards of the Hôpital Necker, in Paris.



SECTION VII.

LUXATION OF THE KNEE, PATELLA, AND ANKLE.

AN examination of the structure of the knee joint would lead one to believe that a luxation of the tibia from the condyles of the femur was hardly possible; yet there are many instances of the kind on record. The luxation may be complete or incomplete, and take place in an anterior, posterior, or lateral direction. Complete luxation is extremely rare,† and generally followed by most violent symptoms, and even death, unless obviated by timely amputation. Lateral luxations, or those outwards and inwards, are more common than either the anterior or posterior. They are all easily distinguished by the peculiar deformity or

* North American Medical and Surgical Journal, No. vii. July, 1827, page 77.

† See page 124, for a case of the kind.

projection of the tibia in the direction the luxation happens to occur.

There is a species of luxation of the knee joint, first particularly noticed by Hey, arising, it is imagined, from relaxation of the ligaments of the semilunar cartilages, by which these bodies become loosened and change their situation. The disease is not very common, but is always found troublesome and difficult of cure. It impedes and sometimes altogether prevents the patient's walking, though there is seldom much pain experienced.

The *patella*, by a sudden blow, is sometimes forced to the outer or inner sides of the knee, and the patient finds himself unable to walk or bend the leg. Luxation *outwards*, is more frequent than that *inwards*, and is characterized by a considerable protuberance on the external edge of the outer condyle. A similar prominence above the inner condyle will denote an *internal* displacement. Occasionally the dislocation proceeds from preternatural laxity of the ligament of the patella, or of the tendon of the rectus muscle. Luxation of the patella *upwards*, or *downwards*, noticed by most writers, cannot take place without a previous laceration of the ligament or tendon above mentioned. In the former case the patella will be drawn upon the front of the thigh two or three inches above the knee joint; in the latter it will remain stationary, except when the leg is bent. A patient belonging to the Philadelphia Hospital affords a very interesting example of luxation of both patellæ *upwards*, from rupture of their ligaments, occasioned by the exercise of leaping. It is remarkable in this case that the man has the use of his limbs nearly perfect, except when he attempts to walk up or down stairs.

The *tibia* and *fibula* may be removed from the *astragalus* in four different directions—outwards, inwards, forwards, and backwards. The luxation *inwards*, however, is the most common of all. It is known by the sole of the foot being turned outwards, and by the inner edge resting upon the ground. Luxation *outwards* on the contrary, may be distinguished by the inclination of the sole inwards. These injuries are frequently conjoined with fracture of the lower extremity of the *fibula*. A *forward* luxation is characterized by a diminution in the length of the front of the foot, and a corresponding in-

crease in the length of the heel. The tibia abandons entirely the astragalus, and rests upon the naviculare and cuneiforme internum. Symptoms of an opposite kind will attend a luxation *backwards*. When from any cause the ankle joint has sustained severe injury, or the bones have been displaced in either of the directions enumerated, violent inflammation and suppuration will be apt to ensue, which may terminate in caries, separation of the astragalus from the surrounding bones, or in ankylosis. In several instances upon record, the astragalus, nearly insulated by the injury, has been extirpated by the surgeon, and a union afterwards procured between the tibia and os calcis. *Compound* and *complicated* luxations of the ankle, which are generally followed by severe and dangerous symptoms, will be considered hereafter under the head of *amputation*.

TREATMENT OF LUXATION OF THE KNEE, PATELLA, AND ANKLE.

By extension and counter-extension, and well directed pressure upon the condyles of the femur or head of the tibia, luxations of these bones are easily reduced; but to combat the inflammatory symptoms that ensue, will be found extremely difficult: and months and even years, not unfrequently elapse before the patient regains the use of the limb, if, indeed, he ever recovers it. It must be obvious, therefore, that all those general and local means formerly pointed out as adapted to the cure of *wounded joints*,* will be found equally necessary in luxations of the knee.

For that variety of luxation described by Hey, under the title of "*internal derangement of the knee joint*," the most effectual mode of relief, is to place the patient upon an elevated seat, and after having forcibly extended the limb, to bend the leg suddenly backwards at a right angle with the thigh.

Luxation of the *patella* is easily reduced, provided the limb be placed in the proper position, at the time pressure is made upon the bone. Unless this be attended to, the patient will suffer immensely, and the surgeon eventually be foiled. To ensure success, the thigh must be bent on the pelvis and the leg extended on the thigh. The most convenient mode of effecting

* See p. 126.

this, is for the surgeon to rest the patient's heel on his own shoulder, or to have it sustained in a very elevated position by an assistant, whilst his hands are employed in forcing the bone into its proper situation.

An inward dislocation of the tibia at the ankle joint should be reduced in the following way. "The patient is to be placed upon a mattress properly prepared, and is to rest on the side on which the injury has been sustained, the surgeon is then to bend the leg at right angles with the thigh, so as to relax the gastrocnemii muscles as much as possible, and an assistant, grasping the foot, gradually draws it into a line with the leg. The surgeon fixes the thigh, and presses the tibia downwards, thus forcing it upon the articulating surface of the astragalus."*

The same principles are to be kept in view in the reduction of the other varieties of luxation at the ankle, taking care to relax the muscles as much as possible, before any attempt be made to push the bones into their proper places. The after treatment must consist chiefly in the removal of inflammation, and in the retention of the bones in their natural position by splints and bandages, until reunion of the ligaments and capsules is accomplished. As the constitution is very apt to sink under severe injuries of the joints, care must be taken not to carry general blood-letting and purgation too far.

Consult Desault's *Treatise on Fractures, Luxations, and other Affections of the Bones*, by Caldwell; Boyer's *Lectures upon the Diseases of the Bones*, by Farrel, vol. ii.; Boyer's *Treatise on Surgical Diseases*, by Stevens, vol. ii.; Dorsey's *Elements of Surgery*, vol. i.; Hey's *Practical Observations in Surgery*; Pott on *Fractures and Dislocations*; Cooper and Travers's *Surgical Essays*; A *Treatise on Dislocations and Fractures of the Joints*, by Sir Astley Cooper, 4to.; C. Bell's *Operative Surgery*, vol. ii.; A letter to the Hon. Isaac Parker, Chief Justice of the Supreme Court of the state of Massachusetts, containing Remarks on the Dislocations of the Hip Joint, occasioned by the Publication of a Trial which took place at Machias, in the State of Maine, June, 1824, by John C. Warren, Professor of Anatomy and Surgery in Harvard University, &c. 8vo. 1826; Dupuytren on Luxations of the Vertebrae, and the Diseases which resemble them, in *Clinical Lectures*, translated by A. S. Doane, M. D.; *Luxationes Experimentis Illustratae, Dissertatio Inauguralis quam Consensu Gratosi Medicorum Ordinis Basiliensis, pro summis in Medicina et Chirurgia honoribus rite Impetrandis Scripsit Ludovicus De Wette Basiliensis Berolini*, 1835; Sir Philip Crampton on the

* Sir A. Cooper, p. 241.

Pathology of Dislocations of the Shoulder, in Dublin Journal of Med. Science, vol. iii. p. 50 and 177; Dissection of a Dislocated Hip, by William Wallace, in Transact. of King and Queen's College of Physicians, vol. v. p. 250; On Dislocations of Hip, with the manner of Reduction, and appearances on Dissection, by James Scott, in Dublin Hospital Reports, vol. iii. p. 389; Dissection after recent Dislocations, by C. H. Todd, ditto vol. iii. p. 395. See American Medical Journal, No. X. 1843, for an account of several cases of luxated knee, reported by Rose, Toogood, Pitt and Parker, English surgeons.

On *Congenital* Luxation of the Thigh Bone, consult Palletta's *Adversaria Chirurgica et Exercitatio de claudicatione Congenita* 1788; Delpech, *De La Orthomorphie*, 1828; Dupuytren *Clin. Chirurg.* tom. iii.; Cruveilheir, *Anat. Patholog.* liv. ii.; Caillard *Bailloniére sur les Luxat. Orig. ou Congenit, des Femurs*, Paris, 1828; Lafonde *sur les Princip. Difformit. du Corps Hum.* 4to. Paris, 1819; North in *Med. Chirurg. Transact.* vol. xix.; Coulson on *Diseases of the Hip Joint*, 4to. Lond. 1837.

CHAPTER IX.

DISEASES OF THE BONES AND JOINTS.

AFTER having detailed, under the heads of fracture and dislocation, the particular *injuries* to which the bones and joints are exposed, it will be proper to speak of the peculiar *morbid* affections to which these parts are liable. The diseases of the bones most commonly met with, perhaps, are caries, necrosis, and exostosis; on the contrary, spina ventosa, osteo-sarcoma, mollities and fragilitas ossium and rachitis, are rarely seen. The principal diseases of the *joints* are coxalgia, white swelling, hy-drarthrus, ankylosis, and the growth of cartilaginous bodies within the articular surfaces. Each of these will be noticed in regular succession.

SECTION I.

CARIES.

By the older surgeons this disease was often confounded with necrosis; it differs from it, however, in the same way that ulceration differs from sphacelus—caries being the result of an inflammatory action which alters the texture of the bone without destroying its vitality—necrosis, the consequence of a peculiar influence that involves the complete or partial death of the original bone, and, at the same time, repairs the injury by the formation of a new one.

The bones are all liable to caries, though the soft or spongy

ones, such as the vertebræ, sternum, head of the thigh bone; the bones of the carpus and tarsus, more frequently suffer than any others. Sometimes the disease may be traced to local injury; at other times it appears to result from constitutional indisposition, such as scrofula, syphilis, cancer. However induced, it is rendered manifest by pain and swelling in the affected part, by a softening or dissolution of the bony fabric, which crumbles away upon the slightest touch, by the discharge of a fetid blackish matter, and by the luxuriant growth of pale fungous granulations. If not arrested by an operation, or by appropriate remedies, the disease generally proceeds until one or more bones are destroyed. Sometimes the patient dies from constitutional irritation; in other instances, a cure is effected by the absorption of the diseased part, and a deposition of healthy matter in its place. But this seldom happens without being followed by more or less deformity. Among delicate females, I have met with several cases of caries of the wrist brought about by slight injuries, which have proved very obstinate and sometimes altogether intractable.

TREATMENT OF CARIES.

When caries depends upon a syphilitic, scrofulous, or scorbutic taint, or upon any constitutional disorder, general remedies must be resorted to. When it arises from local injury, the chief indications in the cure are to combat inflammation, to keep the parts perfectly at rest, and to remove any diseased portions of bone as soon as they become loose. The second indication is a very important one, and will be most effectually accomplished by the use of splints adapted to the shape of the diseased part. If, for instance, the bones of the carpus are affected, a splint should be carved out of some light wood, and made to support the fingers, hand, and forearm. In addition, the forearm, placed in a sling, should be carried across the chest, and the hand made to rest nearly upon the opposite shoulder. This will serve to drain the blood from the limb, and to diminish the inflammation. By these means cures are sometimes effected, after the failure of all other remedies. Many surgeons, particularly the French, are in the habit of removing carious bones by the actual cautery, and by cutting instruments. So far as I have

observed, little benefit appears to result from the practice; indeed in several instances I have witnessed very injurious effects from this mode of treatment; so much so, that I make it a rule never to attempt the removal of a carious bone unless I find it, *sua sponte*, nearly detached. Where the disease depends, as in most cases of caries of the carpus, tarsus, sternum, and heads of the long bones, upon constitutional causes, it would be not less absurd to attempt to remove it by an operation than to cut away carious *vertebræ*. Accordingly, most, if not all, of the operations I have witnessed, in hospital and private practice, for the removal of such parts, have either been followed by aggravation of the symptoms, or by such constitutional disturbance, months afterwards, in the shape of phthisis, or some similar disease, as has sooner or later carried off the patient. Superficial caries, however, of a long or short bone, dependent upon local injury, and occurring in a sound constitution, may often be destroyed by the trephine, chisel, saw, cutting-pliers, or actual cautery. According to Liston, such operations seldom prove successful unless followed by the application of the cautery. In numerous cases I have experienced *partial* benefit, from the ancient practice of touching the diseased bone with some of the *mineral acids*, which serve to dissolve the earthy particles, and to hasten the removal of the morbid mass. Gastric juice of some of the inferior animals, especially that of the hog, has been found sometimes useful, by the late Dr. Physick, as a local application, and no doubt acts upon the same principle as the nitric or muriatic acids. Lunar caustic has been extolled lately by Dr. Nicol. Blisters, issues, setons, and steady purging, are highly serviceable in many cases of constitutional caries.

Consult *Monro's Works*, 4to.; *Hey's Practical Observations in Surgery*; *Callisen's Systema Chirurgiæ Hodiernæ*, vol. i. p. 557; *Wilson on the Structure, Physiology, and Diseases of the Bones*; *Dictionnaire des Sciences Medicales*, tom. iv. p. 78; *Boyer's Treatise on Surgical Diseases*, by Stevens, vol. ii. p. 142; *Liston on Caries* in *Edin. Med. and Surg. Journal*, No. lxxviii.; also *Practical Surgery*, 1840; *Mayo's Outlines of Pathology*, London, 1835; *Nicol*, in *Edin. Med. and Surg. Journal*, No. xciv.; *Symes's Principles of Surgery*, Edin. 1837.

SECTION II.

CARIES OF THE SPINE.

THIS is a very common affection, and often dependent upon scrofulous diathesis. It is generally met with among young children, though adults are by no means exempt from it. Long before any curvature or deformity appears, the disease is often evinced by the following symptoms. The patient complains of a numbness or uneasy sensation in his lower extremities, is languid, soon tired by exercise, and very apt to trip or stumble in walking. While seated, his legs are usually drawn up under the chair and crossed. Generally, there is a flatulence, sickness at the stomach, headach, derangement of the digestive organs, and a peculiar tightness at the scrobiculus cordis. After these symptoms have continued a few weeks or months, the lower extremities become paralyzed, and the patient is unable to leave his bed. Sometimes paralysis of the upper extremities follows caries of the cervical or superior dorsal vertebræ. More or less protuberance may then be observed at some particular portion of the spinal column. Commonly one or more of the *dorsal* vertebræ are affected, the spinous processes of which project backwards and create considerable deformity. Sometimes the disease is seated in the lumbar, but rarely in the cervical vertebræ.

From this disease few recover, without permanent deformity, and many die from hectic fever and irritation. Upon dissection, the bodies of one or several vertebræ are found destroyed by caries, and so great a vacuity created, as to cause the spine to give way, and in fact to produce a species of dislocation, which indeed is the immediate cause of the deformity. In some instances the intervertebral cartilages have been found in part or wholly destroyed, while the bodies of the vertebræ remained nearly entire; but in cases of long standing, both are commonly diseased to a great extent. Occasionally, large collections of matter take place in the neighbourhood of the carious bones, and are so extensively effused in the abdomen, as to form externally a perceptible tumour. From what has been said, it will appear obvious that the paralysis of the lower and upper extre-

mities, and the disturbance of the functions of the thoracic and abdominal viscera, must depend upon pressure on the spinal marrow, and upon a diminution of the cavities in which the viscera referred to are seated.

TREATMENT OF CARIES OF THE SPINE.

Spinal caries often exists long before any deformity is visible. It is important, therefore, when other symptoms are present, to make an accurate examination of the whole of the vertebræ, by running the fingers over the spinous processes, and pressing firmly upon each. In this way, the precise seat of the disease may be ascertained, inasmuch as the patient will complain when pressure is made upon the affected vertebræ. If called, in the very commencement of the disease, the surgeon may perhaps derive benefit from leeches and blisters; these are seldom so efficacious, however, as issues or setons. Caustic issues, in particular, when made on each side of the spine, and in the immediate vicinity of the diseased vertebræ, will always be found highly beneficial, and indeed are more to be relied on than any other local remedies; but in many instances it will be necessary to continue them for months or years. Besides this local treatment, great attention must be paid to the patient's diet, and especial care taken to open the bowels two or three times a week, by some mild laxative. To take off the weight of the head and upper part of the body, and thereby to diminish the irritation about the diseased part, the recumbent position will be found the most effectual; but the patient should not be confined to a close room, or kept constantly in bed; on the contrary, exercise in the open air, on a mattress laid on a small carriage or wagon, may be used during favourable weather to great advantage. When the patient begins to recover the use of his limbs, and there is reason to believe that the carious bone has been removed, and its place supplied by new matter, or that bony depositions have been thrown out in the neighbourhood of the diseased vertebræ, in the form of splints or ledges,* sufficient to support the spinal column, gentle exercise by walking may be allowed. To support the body and head during

* Several specimens of the kind, both in the human subject and inferior animals, may be seen at the Wistar Museum.

such efforts, various mechanical contrivances have been resorted to. The common stays and steel rod, invented by Levacher, drawings of which may be seen in most systems of surgery, are in very general use, though I prefer the machine of Eagland, made upon the principle of Levacher's, but, I think, superior to it, inasmuch as the pressure, necessarily made by the stays on the hips, is divided between these and the lower extremities, which are supported by sheet-iron splints, connected with each other by hinges at the hip, knee, and ankle joints, having shoes attached to the lowermost, and worn by the patient.

It is of the utmost importance, in the treatment of diseases of the spine, that a distinction be drawn between *caries* of the vertebræ and lateral and other *distortions* of the spine unconnected with caries.* In the former case long-continued rest and the other remedies mentioned, are indispensable in the early stages of the complaint; in the latter, various forms of machinery, conjoined with gymnastic exercises, with the view of exercising and strengthening the muscles of the back,—upon weakness of which such distortions generally depend,—must be resorted to. Unfortunately the two diseases are often confounded, and both treated upon the same principles. This is owing as much, there is reason to believe, from such complaints being generally under the management of *spine doctors*, and quacks, who with their neck-stretchers, and patent balances, and go-carts, and other mischievous playthings, do as much injury in *caries*, as they sometimes do good in simple deformities.

It is much to be lamented, indeed, that many *physicians*, quite respectable and intelligent in their own particular sphere, but wholly incompetent to treat surgical diseases, should publish in journals, twopenny papers filled with the most erroneous and preposterous notions of the pathology and treatment of spinal affections, and set themselves up as inventors and contrivers of machinery, without having the slightest mechanical ingenuity, or the most remote idea of the principles upon which such machines should act, or of the powers, injurious or beneficial, they are calculated to exert. Hence the complicated, grotesque, ponderous, ungainly, lumbering spinal oddities with which instrument makers' windows are crowded.

I say nothing here of the plan suggested and put in practice

* See *Deformities* at the end of this volume.

by Guerin of Paris—the division of the tendons of the back in case of lateral and other deformities of the spine—because the recent reports on this subject by other eminent French authorities are decidedly adverse to the statements of Guerin, and such as to make us cautious how we resort to measures not yet sufficiently established by the sanction of the profession.

Consult Pott's Works, by Earle, vol. iii. p. 229 and 257; Earle's Observations on the Cure of Curved Spine, London, 1803, 8vo.; Bradley's Observations on a Stridulous Affection of the Bowels, and on some Varieties of Spinal disease, London, 1818, 8vo.; Brodie's Pathological and Surgical Observations on Diseases of the Joints, p. 259, London, 1818, 8vo., 4th edit. 1836; Copeland's Observations on the Symptoms and Treatment of Diseased Spine, London, 8vo.; Wilson's Lectures on the Structure and Physiology of the Skeleton, and on the Diseases of the Bones and Joints, p. 395, London, 1820, 8vo.; Crowther's Practical Observations on the Diseases of the Joints, commonly called White Swelling, p. 216, 8vo. London, 1808; On the Nature and Treatment of the Distortions to which the Spine and the Bones of the Chest are subject, with an Inquiry into the Merits of the several Modes of Practice, which have hitherto been followed in the Treatment of Distortions, illustrated by plates, in folio, by John Shaw, surgeon, &c., London, 1823; Further Observations on the Lateral or Serpentine Curvature of the Spine, and on the Treatment of Contracted Limbs, with an Inquiry into the Effects of Various Exercises, and other means which are used to Prevent or Cure these Deformities—being a Supplement to the Work on Distortions of the Spine and Bones of the Chest, by John Shaw, &c. 8vo. 1825; An Essay on Curvatures and Diseases of the Spine, including all the Forms of Spinal Distortion, to which the Fothergillian Gold Medal was awarded by the Medical Society of London, and presented at a special general meeting, on the 3d of May, 1824—with some Additions, by R. W. Bampfield, Esq. &c.; Guerin, in Gazette Medicale, *passim*.

SECTION III.

COXALGIA.

NUMEROUS appellations have been employed to denote this affection—such as *morbus coxarius*, *ischias*, spontaneous luxation of the *os femoris*, scrofulous caries of the hip, abscess of the

hip joint, &c. The term coxalgia, invented by the late Dr. Albers of Bremen, seems to me the most appropriate.

Persons of all ages are liable to the disease, which is exceedingly common, especially among weak and scrofulous children. The symptoms in the commencement are not always strongly marked. Often the first evidence the surgeon has of its presence, is a slight pain in the knee, and a perceptible emaciation of the whole limb. This pain, in the estimation of Sir Charles Bell, is owing to the obturator nerve being involved in the inflammation about the joint; "for the nerve," says he, "passes through the thyroid foramen, down to the hip joint, and after supplying the muscles is distributed upon the inner part of the knee. The nerve in its course is thus involved in the inflammation, which affects the hip joint, and the pain is referred to its extreme cutaneous branches, at a part distant from the seat of the disease."

In a short time pain is felt about the trochanter and groin, to relieve which the patient supports his whole weight upon the sound thigh and leg; hence the diseased limb is commonly directed forward and bent at the knee, and appears considerably elongated. This apparent increase of length is altogether owing to an inclination of the pelvis and a corresponding change in the vertebræ. Many children suffer comparatively little for months together, whilst others are scarcely free from pain about the hip or knee during the whole course of the disease. In a few instances ankylosis is established, and a cure effected without, so far as can be observed, the formation of pus; generally, however, this fluid becomes manifest after the complaint has made some progress, and is sometimes secreted so copiously as to surround the head and upper extremity of the thigh bone, forming a large abscess which may remain stationary for months, and at last discharge itself by one or more openings about the hip and groin. In the mean time the acetabulum and the head of the femur undergo important changes. Their cartilaginous coverings are first destroyed by ulceration, then the bones are rendered carious and crumble away, the head of the thigh bone is partially or entirely destroyed, and being removed from the socket, the shaft is drawn upwards by the action of the muscles, the limb is shortened by several inches, and the foot generally turned inwards. During these different changes the constitution is gradually undermined by hectic, and not unfrequently the patient dies: at other times,

he slowly recovers strength, ankylosis takes place, the fistulous openings heal up, and a cure is accomplished, but seldom without considerable deformity.

Such is the common course of the disease; but I have known one case, which occurred under my care in the Philadelphia Hospital some years ago, where suppuration took place in each acetabulum, followed by spontaneous opening and discharge of a small quantity of pus; after which, the discharge gradually ceased, the openings healed up, and the boy recovered in a few weeks without deformity or lameness. Sometimes the foot and limb, instead of being turned inwards, are directed outwards. This will depend, I imagine, in some measure, upon the position the patient has been accustomed to lie in, and in others upon the direction the head of the bone or its remains may happen to take after abandoning the acetabulum; for among the numerous morbid specimens contained in my cabinet, I find the upper extremity of the shaft resting upon the obturator opening in some, in others, upon the tuber ischii, in others upon the pubes, but generally on the dorsum ilii. Occasionally it happens that the head of the thigh slips from the acetabulum, before it has undergone any important change, the capsule, round ligament, and cartilages of that cup having been previously destroyed by ulceration. At other times the bony texture of the acetabulum is destroyed by caries, and the head of the thigh bone or its shaft enters the pelvis. Indeed it has long ago been observed by Ford and others, that the acetabulum is generally more diseased than the head of the femur.

Ankylosis is not an invariable termination of the disease after recovery; for instances now and then occur of the formation of a new joint. One instance is mentioned, especially, by Professor Cooper, of a new ball being formed on the ilium, which corresponded with an articular cavity on the top of the thigh bone. It is difficult to say whether hip disease is most common in girls or boys. The former opinion is held by Morgagni, the latter by Albers and others. About six or eight years of age is the period at which it most frequently occurs: though it is met with in adults and even in old people. Some patients die dropsical before any important changes have taken place about the joint; others perish from hectic in a few months. A still greater number live for a much longer time, and a few I have known to survive nine or ten years, and then sink from debility and other

constitutional derangement, connected more or less with disease of the lungs and other viscera. Upon the whole, there are few more diversified or intractable complaints, or that absolutely require all the skill of an experienced surgeon. It is vexatious, therefore, to find how often the disease comes under the temporizing treatment of the mere *physician*, who, after exhausting his skill, turns the case over to the surgeon—by whom, if managed, *ab initio*, a cure would often be effected in a few weeks.

TREATMENT OF COXALGIA.

One of the most important measures, in the treatment of coxalgia, is to correct as speedily as possible, the habit the patient acquires of bending the thigh on the pelvis, and the knee on the thigh. This may be accomplished generally by extending a splint from the hip to the heel. Should the surgeon be called in the commencement of the disease, which seldom happens, blisters may be applied behind and before the great trochanter, and kept open for a considerable time by savin cerate or by the caustic potash, or still better by mezereon ointment. Issues or setons, however, generally answer a better purpose, inasmuch as they are less liable to dry up. But none of these local means prove of much service, unless conjoined with steady purging, and perfect rest. Should the disease, notwithstanding these proceedings, continue to increase, and at last terminate in suppuration, the abscess ought never to be opened, and if it break spontaneously, must be healed as soon as possible. During the *suppurative* stage great pains should be taken to support the patient's strength.

As the late Dr. Physick devoted a great deal of attention to the treatment of this disease, and introduced into practice some valuable improvements not generally known to the profession, I shall here insert several extracts from a paper, containing an account of them, and drawn up some years since, under Dr. Physick's inspection, by Dr. Jacob Randolph.

“Before commencing the treatment of a case of *morbus coxarius*, it is Dr. Physick's invariable practice to explain to the patient or his friends, the chronic nature of the complaint, and the probable length of time which will be required for its cure,

even under the most favourable circumstances. He also informs them that they are not to expect much immediate benefit from the treatment, and that unless they are determined to persevere, it is useless for him to undertake the cure. By a candid exposition of this kind, the physician may frequently be spared the unpleasant reflections which patients are sometimes apt to make when their too sanguine anticipations are not realized. It is of some importance that the bed upon which the patient is to be placed should be constructed of proper materials. Dr. Physick always directs a hair mattress to be employed. The patient being confined to bed with a proper understanding that he is to continue there for a long time, and that rest in a horizontal position is absolutely necessary for a cure, Dr. Physick commences the treatment by the administration of a mercurial purge. In a patient from six to ten years of age, he would give two or three grains of calomel, to be taken at bed-time, and to be followed by a dose of castor oil the next morning, unless it should operate freely previously. The patient having been kept still for a few days, the doctor next makes a very careful examination of the parts about the hip-joint. If he find these to be inflamed and swollen, and tender to the touch, he directs the application of a sufficient number of leeches to take away, from a patient of the age I have mentioned, four or six ounces of blood. In general he does not prescribe much reduction in the diet, unless the inflammation be very acute, and the patient suffer from fever; in most cases he advises a wholesome light diet. The next object which demands the attention of Dr. Physick, is the commencement of a course of steady and systematic purging. The experience which he has had in this complaint, has impressed him with the belief that this last measure is very superior to most of the remedies generally employed, such as emetics, fomentations, blisters, caustic issues, &c. He even views the seton in the groin, so strongly recommended by Sir Benjamin Brodie, as being much less efficacious than the establishment of a drain from the bowels by means of active, long-continued purging. It is not very material which of the cathartic remedies be employed for this purpose; it is proper, however, that the medicine should be changed occasionally, either as it may lose its effect, or as the patient may acquire a dislike to it."

"The cream of tartar and jalap may be considered as the

most convenient and best cathartic. Dr. Physick has employed this remedy for a very long time in these cases, and he also recommended it highly, many years since, in his surgical lectures, for the treatment of caries of the spine. It should be administered every other day, in sufficient doses to procure several copious evacuations. Having pursued the above treatment for a few weeks, and accustomed the patient to his confinement to bed, Dr. Physick next proceeds to the application of the remedy, which he considers to be the most important and efficacious one that has ever been employed in the treatment of morbus coxarius. This consists in a splint properly carved so as to be adapted to the irregular size, shape, and position of the diseased hip joint, thigh, knee, and leg. It must also be carved so as to fit the principal part of the same side of the trunk. The whole must be long enough to extend from the middle of the side of the thorax, nearly as far down as the internal malleolus, and it should be wide enough to extend nearly half way round the parts to which it is applied. In those cases in which the thigh is bent upon the pelvis, and the leg upon the thigh at the knee joint, the surgeon must by no means attempt to force the limb into a straight splint. On the contrary, the splint must be made angular at those parts so as to adapt itself to the exact position of the limb, however crooked it may be. After the patient has worn a splint of this shape for some time, the inflammation and swelling become so much relieved, that the limb can be placed in a much straighter position; and now it becomes necessary to have a second splint constructed which will adapt itself to the altered position of the parts. It seldom happens that more than two splints are required in the treatment; it has, however, occurred to Dr. Physick, to be obliged to have recourse to three and even four. The inside of the splint must be carefully wadded, in order to prevent it from excoriating the skin, and it must be retained in its proper situation by means of two rollers, one of which should be attached to the upper end of the splint, so as to secure this part to the upper thorax and hips, whilst the other is applied to the splint and limb from the ankle to the top of the thigh. The length of time which may be required for the performance of a cure, varies in general, from six months to two years, though the usual period is about twelve months. During all this time the splint should be kept steadily applied; the surgeon, in fact, should not remove it until some time after all the symptoms and

appearances of the disease have entirely subsided. As soon as there is sufficient reason for believing that the disease is completely cured, the exercise of the limb may be resumed in the most cautious and gradual manner. When the splint is first applied, the child in general is restless and uneasy, and frequently complains so much that it becomes necessary to remove it for a short time, in order to pacify him; after a few days, however, he gets completely accustomed to the splint, and experiences so much relief from pain that he is extremely unwilling that it should be taken off even for a short time. It may be said that this treatment is not applicable to cases of morbus coxarius occurring in patients of a decidedly scrofulous constitution; so far is this from being correct, however, in several instances complete cures have been effected in such patients.

"In order to have the splint properly constructed; it is necessary to employ a regular carver. Mr. Rush, an ingenious workman of this city, is always resorted to by Dr. Physick for this purpose.

"It is scarcely necessary for me to add, that the treatment which I have just detailed, is particularly adapted to morbus coxarius prior to the period of suppuration. When abscesses form and burst, it generally becomes necessary to apply soft poultices, and in some instances to support the patient's strength by gentle stimulants and a nourishing diet. The splint, however, must be regarded as the important remedy in all cases in which the head of the femur is not either destroyed by caries or pushed out of its natural socket by the disease, and even then it favours a cure very considerably by promoting ankylosis.

"Before concluding it may not be uninteresting to state, that Dr. Physick has applied the same plan of treatment to numerous affections of other joints with the most happy results. He has adapted the carved splint to the elbow, the knee, and the ankle, and has frequently found this remedy to succeed when all others have failed."

European surgeons are now so fully aware of the importance of Dr. Physick's mode of treating coxalgia, as to have adopted it very generally within the last few years. In particular, Sir Benjamin Brodie, in the last edition of his valuable work on diseases of the joints, inculcates very strongly the absolute necessity of rest, and of confinement of the limb by pasteboard and leather splints; whilst, at the same time, he enjoins the use

of such other remedies as have been found, from time immemorial, useful by surgeons all over the world. These are, as is well known, sea and other bathing, topical blood-letting, fomentations, blisters, issues, or setons behind the trochanter or in the groin, the moxa, or actual cautery, light nutritious diet, enjoyment of fresh air, &c. To which may be added some of the remedies suggested and employed in modern times:—the internal use of hydriodate of potash, calomel and opium combined, colchicum, antimony with morphia, extract of aconitum, the aconitine ointment, pledgets of emplastrum saponis, as used by Scott, together with Liston's modification of Physick's splints, made of lint and gum-arabic, and suffered to harden on the limb until they form a complete mould calculated to ensure perfect rest.

Thirty or forty years ago, the operation of amputation at the hip joint was resorted to in Europe, in two or three instances, for the removal of coxalgia, but with such disastrous results as to leave a lasting impression upon surgeons. Unmindful, or perhaps ignorant, of such precedents, a few modern surgical desperadoes, ambitious of displaying the last new flourishes of the knife, and of slashing their way into notice, have followed the example; and although the patients have not actually died, always under their hands, they have soon enough perished from return of the disease: barely leaving the operators time to publish their cases as *successful*. Can there be any thing more absurd than such exploits, or better calculated to evince ignorance of pathology and sound practical views—especially when it is recollected that the acetabulum is oftener diseased than the thigh bone, and that in nine cases out of ten, the disease is, at any rate, constitutional rather than local?

Consult Ford's Observations on the Disease of the Hip Joint; Crowther's Practical Observations on the Diseases of the Joints, p. 256; Brodie's Pathological and Surgical Observations on the Diseases of the Joints, 4th edit.; Wilson on the Bones, p. 379; Dorsey's Surgery, vol. ii. p. 277; Randolph's account of Physick's mode of treating Hip Disease, in the Philadelphia Journal of Medical Sciences for 1831; Scott on Diseases of the Joints, 8vo. Lond. 1828; H. Mayo on Ulceration of Cartilages of Joints, in Med. Chirurg. Transact. vol. ii. and vol. xix.; W. J. Wickham on Diseases of the Joints, 8vo. 1833; W. Coulson on Disease of the Hip Joint, 4to. London, 1837.

SECTION IV.

NECROSIS.

THIS, in a pathological point of view, has always been considered the most interesting disease to which the bones are subject, and many theories have been framed to explain the cause of the death of the old bone, and the reproduction of the new. So far as opportunities have been afforded me of ascertaining this point, I have no hesitation to express the belief, that the periosteum is the chief agent in both processes. If from any cause the periosteum inflame, and matter is poured out between it and the bone, so as to separate one from the other, all vascular intercourse must cease, or at least the bone must then depend exclusively for its support upon the internal periosteum and marrow; but these being inadequate to furnish the requisite supply, a part or the whole of the bone will necessarily perish. It generally happens, however, that the shaft alone suffers, whilst its heads remain unimpaired—owing to their possessing an independent vascularity. Thus deprived of its vitality, the bone soon becomes a source of irritation, and according to the laws of the animal economy, must be removed by the absorbents. Before this process is accomplished, however, the inflamed periosteum becomes thickened and covered with granulations, which soon ossify and form a complete bony case, enclosing the old dead bone within its cavity, and forming a junction with its epiphyses, if they happen to remain uninjured. But the old bone, thus enclosed, is not always absorbed—owing sometimes to its magnitude, or to want of activity in the absorbents. In this case it continues a source of irritation for years together, and sometimes destroys the patient; or else fragments of it, or *sequestra*, are from time to time discharged through ulcerated openings formed in the new bone. After the whole are discharged, these openings gradually fill up, the bed or cavity formerly occupied by the old bone becomes obliterated by the deposition of ossific granulations, and the patient generally recovers without any deformity, except that arising from the augmented size of the new bone, and the cicatrices left in the soft parts corresponding with the holes through which the sequestra were removed. Necrosis sometimes, though

rarely, arises from inflammation and suppuration of the internal periosteum, and produces effects nearly similar to those just described. No better evidence need be adduced in support of the doctrine, that the periosteum is the chief agent in the production of the new bone, than the circumstance of the tendons retaining the precise situation which they occupied before the destruction of the old bone.* There are several other doctrines, each advocated by men equally eminent. But it would be impossible to enter upon them here without furnishing a regular dissertation, such as the limits of the work, chiefly devoted to practical details, render inadmissible.

The cylindrical bones are most subject to necrosis, and the tibia is more frequently affected than any individual bone. Next to this the humerus, femur, lower jaw, clavicle, radius, ulna, and fibula, are most apt to be affected. In the Wistar Museum there is a thigh bone of enormous dimensions and weight, exemplifying the combination of necrosis and exostosis in a most remarkable manner. The whole of the lower jaw is often removed in cases of necrosis, and what is very surprising, the original teeth are completely transferred to the new bone, and suffer little if any injury. Although the flat bones are not so subject to necrosis as the cylindrical, yet the disease is by no means uncommon. The os frontis, the parietal bones, and the scapula are most apt to suffer. Patients of all ages are liable to the disease, but it is seldom met with except in children and young subjects. In every stage of the complaint the pain is deeply seated, long continued, and often excessively severe.

TREATMENT OF NECROSIS.

General remedies are of little service in this disease, and local applications, though they may assuage the pain, rarely prove of much utility. It is true that Abernethy and Crowther have extolled the use of blisters, kept open by savin cerate, as calculated to promote absorption of the old bone; but from several trials of the kind, which I have made, I am much inclined to question the efficacy of such remedies, and therefore, of late years, have been contented to let nature take her course, until the

* For a full account of this doctrine, see Macartney's Letter, in Crowther's *Practical Observations on Diseases of the Joints, &c.*, p. 193; also, Allan's *Surgery*, vol. ii. p. 21.

old bone has been so far loosened as to appear externally, or to be easily moved by the probe. In either case, the opening in the new bone may be enlarged by Hey's saw, or by the trephine, and the sequestra removed by forceps. In four or five instances, I have, in this way, drawn out portions of the femur and tibia upwards of six inches long. After the fragments are carefully extracted, the fistulous openings in the new bone and integuments speedily close. When the disease occupies the entire shaft of a long bone, and has continued for many years, it sometimes happens that the patient's constitution suffers so much, through the medium of hectic, and other symptoms, as to require the operation of amputation.

See Russel on Necrosis, 8vo. Edinburgh, 1794; Boyer's Surgery, by Stevens, vol. ii. p. 135; Hutchinson's Practical Observations in Surgery, p. 180; Thomson's Lectures on Inflammation, p. 39. The most original and complete works on Necrosis, are Weidman's elaborate publication, *De Necrosi, Ossium et de Necrosi Ossium Annotatio*, and the Thesis of Dr. M'Donald, "*De Necrosi ac Callo*,"—both are extremely scarce. H. Mayo's *Outlines of Pathology*, Lond. 1835; Stanley, in *Lond. Med. Gazette*; Cooper's *Dictionary of Surgery*, 7th edit. Lond. 1839.

SECTION V.

EXOSTOSIS.

IN health a balance exists between the absorbent and exhalent vessels, which preserves each part of the animal frame within regular bounds. Deviations from this natural standard, in many instances, produce diseases, differing in situation, degree and character, from the slightest perceptible change of organization, to the most unlimited extent of morbid structure. Hence two opposite classes of disease result—according as the laws which regulate the decomposition or increment of the body predominate. In one case, the constituent particles are removed, and diminution is the consequence: in the other, an undue proportion

of matter accumulates ; giving rise to general enlargement or to excessive deposition, in some individual texture. In this way every tumour must form. A tumour, whether formed of cellular membrane, skin, muscle, or bone, is a vascular, organized mass ; receiving a supply of homogeneous particles from the texture upon which it is reared or with which it is assimilated. If this view be correct, we may perhaps conclude that such diseases, in their incipient state or original formation, do not differ in composition from the organ or part from which they are derived ; but acquire specific characters, as they increase, from peculiarities of constitution or from local causes, the operations of which are not always easily explained. That diseased superstructures, or "new productions which made no part of the original composition of the body,"* never exist, we cannot pretend to assert : but, we are inclined to consider such formations extremely rare. The immediate foundation of every tumour is probably laid in a bed of coagulable lymph : this lymph is rendered vascular, increases in every direction, in proportion to its supply, becomes smooth or irregular, soft or hard, fleshy or bony, parenchymatous or medullary, according to the original structure from which it is derived. How it is enabled to assume specific, vitiated, or malignant characters, cannot satisfactorily be explained, so long as our knowledge of the operations of nutrition and secretion are confined within narrow limits.

Exostosis appears generally as a distinct tumour of a bone, is smooth on the surface, seldom painful, and may remain long without becoming very large. Occasionally, the whole surface of a bone is found rugged or scabrous ; consisting of numerous plates laid over each other, and sometimes piled to a considerable height in thick irregular masses. Again ; the disease appears in the form of tuberculated knobs or irregular excrescences, closely connected, or insulated. In a third variety, spinous processes or bony spires, are eked out several inches, and terminate either in a sharp point or knob. After careful examination of diseased bones in the splendid cabinet of the late Dr. Wistar, and of numerous specimens in my own collection, I have met with no other forms of exostosis, than those mentioned. I conclude, therefore, that the disease seldom appears in any other shape, and

* See Abernethy's Surgical Works, vol. ii.

under this impression shall denominate each variety according to its external characters. The first I shall call *circumscribed* exostosis, the second *lamellated* exostosis, the third *tuberculated* exostosis, and the fourth *spinous* exostosis.

Under the term exostosis, authors comprehend several diseases, essentially different in symptoms, structure and appearances. Thus, we have the "*fungous exostosis*," which, according to the account given of it by the late Sir Astley Cooper,* must be the osteo-sarcoma, or osteo-steatoma, complaints specific in their nature, and in structure very remote from exostosis. The same may be said of *spina ventosa*. The divisions made by the French writers, founded upon supposed causes of the disease, such as the scrofulous, darterous, syphilitic, scorbutic, and carcinomatous exostosis, are equally faulty, since they do not designate any variations of structure or form, but only imaginary shades of difference. Upon the whole, then, we are inclined to consider exostosis as a mere enlargement, from inordinate deposition of ossific matter transcending the natural limits of a bone, in the shape of a spherical tumour, a plaited covering, an irregular excrescence, or a pointed production; in each of which, however different the figure, the structure is the same.

The bones are all subject to exostosis;—sometimes the disease prevails universally. An instance is related by Mr. Abernethy, "of a boy who was so excessively affected with an apparent predisposition to exostosis or an exuberant deposition of bony matter, that a very trifling blow would occasion a bony swelling on any bone of his body. His ligamentum nuchæ was ossified, and prevented the motion of his neck; the margins of his axilla were also ossified, so that he was, as it were, completely pinioned. Besides all this, the subject in question had numerous other exostoses on various parts of his body."† Saucerotte‡ has detailed the history of a man thirty-five years of age, in whom all the bones, except the teeth, were increased to double their natural thickness, but remained of the ordinary length. The skull became so large as to present a hideous appearance, and the eyes were forced from the sockets. The ribs were approximated, and the sternum, clavicles, and scapulæ, uncommonly

* Cooper's and Travers' Surgical Essays, part i. p. 170.

† Cooper's Dictionary of Surgery, vol. i. p. 288.

‡ Medical and Physical Journal, vol. i. p. 491.

prominent. During the increase of the bones the patient could not move himself, breathed with great difficulty, and suffered from pain in every part. The pulse was scarcely perceptible, and the urine deposited a thick white sediment. After suffering for seven years he died, but permission could not be obtained to examine the body. Such is sometimes the predisposition to exostosis, that even the muscles and tendons are completely ossified. A striking example of the kind is recorded by Dr. Henry.* The patient was a labourer, nineteen years of age, and first perceived a painful swelling in his right wrist, which gradually increased, involving all the muscles of the forearm and converting them into a solid bone, as high as the elbow. The left arm was attacked in a similar manner; then the right leg from the ankle to the knee, and finally the disease extended from the shoulder to the fingers of each arm. Of the individual bones, the cranium, lower jaw, ribs, sternum, and long bones of the extremities, are particularly liable to suffer from exostosis.

The frontal, parietal, and occipital bones, are sometimes irregularly thickened by ossific depositions; at other times they are changed into regular plates of uncommon thickness. There is a skull in the possession of Dr. Parrish, of this city, taken from a young negro, in which all these bones are upwards of an inch in thickness, and extremely compact and solid. Examples nearly similar are given by Sandfort.† The os frontis is more subject to exostosis than either the parietal or occipital bones. Frequently the external table is covered with bony excrescences, composed of spicula, resembling crystallizations.‡ Occasionally both tables are involved, and encroach upon the dura mater and brain. Every variety of exostosis has been found on the skull; but the lamellated is the most common.

Exostosis may occupy the orbit, and become so large as to displace the eye. A few cases of the kind are recorded by writers. In the *Edinburgh Medical and Surgical Journal*,§ an interesting history is furnished by Mr. Lucas, of a bony tumour an inch and a half in length, two inches five-eighths in circumference, and weighing an ounce and two drachms; which grew from the orbit of a woman twenty-eight years old, and forced

* *Philosophical Transactions*, vol. xxi. p. 89.

† *Museum Anatomicum*, vol. ii. p. 13.

‡ *Baillie's Engravings of Morbid Anatomy*, p. 208. § *Vol. i. p. 405.*

the eye forwards and outwards, causing it to hang beyond the exterior edge of the socket. The disease was produced by a blow from a cow's horn, on the upper and inner angle of the orbit, nearly on the transverse suture. Mr. Lucas divided the upper eyelid and exposed the bone, which was so firmly fixed as to withstand every effort to extract it. The wound did not heal, and the bone continued to increase for some time. At length it became carious, and was finally drawn away, but not without difficulty. The eye was placed in its natural situation; and the sight, although nearly destroyed by pressure, was soon completely restored. Upon analysis, the tumour was found to consist of cartilage, phosphate of lime, and carbonate of lime, was extremely irregular, resembled a wedge cut out of a sphere, and so hard as to admit of being polished like ivory. A very striking example of inordinate deposition of bony matter, upon the orbits and adjacent parts destructive of each eye, is recorded by Howship.* A man aged fifty took cold; inflammation supervened, and a tumour of the size of a hazel-nut formed below the inner angle of each eye. These continued to enlarge, and were attended with intolerable pain, which extended to the bones of the face and head. The eyes were constantly inflamed and pressed forward in proportion as they were encroached upon, until they were displaced and burst. When examined by Mr. Howship, in 1815, the patient, independent of loss of sight, and occasional headach, enjoyed good health. The tumours of the maxillary bones were as hard as ivory, and not in the least painful when pressed, filled the orbits and enclosed the nasal bones so as to obliterate the nostrils. A large exostosis of the consistence of ivory, and filling the left orbit, is represented in Dr. Baillie's plates of morbid anatomy.

The facial bones are frequently the seat of exostosis. "We have," says Sir Astley Cooper, "in the collection at St. Thomas's Hospital, a skull which I took from a fish woman who died in that hospital, who had long been remarkable—even at Billingsgate for her hideous appearance. Two large swellings had been formed under the orbits in the fore-part of her cheeks, between which the nose appeared wedged and the nostrils were closed: each eye projected considerably from its socket. This person was seized with a fit, which seemed to be of an apoplectic nature, and in that state was brought to St. Thomas's Hospital,

* Practical Observations in Surgery, p. 26.

where she almost immediately died. Upon examination of the head, an exostosis was found growing from each antrum, and forming the large swellings upon the cheeks: these also projected into the orbits so as to occasion the protrusion of the eyes. On the left side the exostosis entered the cranium, projected inwards through the orbital process of the os frontis, and occasioning such pressure upon the brain, as under a considerable excitement of the vessels of that organ, to produce apoplexy, which proved fatal to her.”*

An exostosis sometimes arises from the cavity of the antrum maxillare. At other times the polypus or fungus which sprouts from the lining membrane of that sinus is converted into a hard and incompressible exostosis. Mr. Abernethy† has furnished a very curious case of this description. The patient suffered more than nine years with a fungus, which bled profusely, but finally sloughed during a fever. A bony mass soon rose upon the edges of the walls of the antrum, projecting in a sloping form, and resembled a large tea-cup, fastened upon the face. The tumour was irregular on the surface and became too large to admit of extirpation. I am informed by Dr. Physick, that a case of fungus of the antrum, which terminated in a bony tumour, occurred to the late Dr. Jones of this city. Bordenave‡ has cited two cases of exostosis of the antrum, of enormous magnitude and of very solid texture. In one the patient was cured by the knife and cautery. The other was too large to admit of the operation, and after death, was found, upon dissection, smooth, polished, and extremely hard, on the surface, less compact internally, and resembling very much the structure of pumice stone. Boyer§ relates the case of a soldier who suffered upwards of ten years with an exostosis of the left maxillary sinus, which produced epiphora, pushed the eye forward, displaced the nose and palate bones, and rendered the visage truly hideous. The disease proceeded from syphilis, and was at last cured by the long-continued use of corrosive sublimate and the liquor of Van Swieten. Many examples of supposed exostosis of the antrum have been furnished by authors; there is reason to

* Surgical Essays, part i. p. 171.

† Transactions of a Society for the Improvement of Medical and Chirurgical Knowledge, vol. ii. p. 307.

‡ Mémoires de l'Académie Royale de Chirurgie, tom. xiii. p. 408.

§ Traité des Maladies Chirurgicales, tom. vi. p. 168.

believe, however, that most of the cases described as such, have really been fungous tumours mixed with bony particles, or surrounded by bony coverings, as in osteo-sarcoma, and spina ventosa—diseases essentially different from exostosis. The monstrous tumour of the antrum contained in the Heaviside Museum, and described by Howship and Fox,* and the interesting specimen delineated by Sandifort,† in his account of the collections of Albinus, Rau, and Van Doveren, were undoubtedly fleshy excrescences incorporated with considerable portions of bony matter.

The alveolar processes of the upper jaw are subject to exostosis. In several instances I have removed from the gums, tumours, partly sarcomatous and partly bony. In one case, I took from the alveolar processes of the left side of the upper jaw of a negro woman, forty years old, a very solid exostosis, which carried before it several of the teeth. The tumour equalled in size a walnut, and was so completely identified with the jaw as only to be removed by Hey's saw and a strong bistoury. The complaint never returned. Cullerier‡ gives the history of an exostosis seated on the right side of the upper jaw just above the canine teeth and the adjoining molares. Pelletan supposed the tumour to contain a fluid, while Dubois considered it a fungus from the gums. It turned out, however, a very solid exostosis, and was successfully removed by the chisel and mallet.

In the lower jaw I have seen both the circumscribed and tuberculated exostosis. The former is most common, and generally seated between the angle and symphysis. In the splendid work on the bones, by Chesselden,§ there is a fine representation of an enormous irregular exostosis, which originated from fracture, gradually increased for twenty years, and then caused the patient's death. Gooch|| relates the case of a woman, whose lower jaw was enlarged in its whole substance from the angle to the chin, was very prominent, and measured fifteen inches in circumference from these points: notwithstanding its magnitude, the tumour occasioned very little impediment to the motion of the jaw; nor was it painful. It had been growing between two

* See Howship's Observations in Surgery, and Fox on the Teeth.

† Museum Anatomicum, vol. ii.

‡ Dictionnaire des Sciences Médicales, tom. xiv. p. 228.

§ Osteographia, or the Anatomy of the Bones, Tab. XLII. fig. 2.

|| Chirurgical Works, vol. ii. p. 96.

and three years, and arose without external injury. The patient enjoyed perfect health. Several French writers, especially Bordenave,* have described, under the title of exostosis, very large bony tumours of the lower jaw; but in every instance, so far as can be determined from their histories, they have appeared to me cases of spina ventosa or of osteo-sarcoma, and as such shall be noticed hereafter.

The humerus is subject to every variety of exostosis. The circumscribed and spinous are most common. Several specimens, in the Wistar Cabinet, have these varieties blended. In four examples the bone is uniformly enlarged, from near its head almost to the middle, and from this enlargement several spinous processes above an inch long project. (See Plate XVII., fig. 1.) The condyles and head of the bone are free from disease. Sandifort† has described and delineated an exostosis which arises at the middle of the humerus by a narrow neck, forms an arch, and is then implanted by a bulbous extremity into the shaft of the bone—leaving a space between it and the tumour. In other examples, by the same writer, several spinous processes start in a cluster from the os humeri, immediately below its head. Again, single tuberculated exostoses spring from the neck of the humerus and resemble the great trochanter of the thigh. Several circumscribed exostoses, also of considerable magnitude, are described as occupying half of the humerus.

Exostosis of the scapula is extremely rare. Sir Astley Cooper‡ never met with the disease. Sandifort§ mentions an instance where bony depositions, in great profusion, covered the acromion and coracoid processes, and surrounded the head of the humerus.

The bones of the forearm are seldom affected by exostosis. I have three specimens in my collection—two of the ulna and one of the radius. The tumours are smooth, circumscribed, seated about the middle of the bones, and the size of a walnut. I have never met with genuine exostosis of the metacarpal bones or fingers, although spina ventosa of these bones sometimes occurs, as will be shown subsequently.

Venereal exostosis of the clavicle is by no means unfrequent;

* Mémoires de l'Académie, tom. xiv. p. 123.

† Museum Anatomicum.

‡ Surgical Essays, p. 174.

§ Museum Anatomicum, vol. i. p. 222.

but I have seen one instance only where it was independent of that complaint. The tumour was larger than an egg, circumscribed and smooth, occupied the middle of the clavicle, and arose from external injury. The patient was a labourer, forty years of age, and sustained no inconvenience from the swelling.

The ribs are sometimes studded over with small exostoses, and in some rare instances considerable bony masses are thrown out between the intercostal spaces. There is a specimen of this kind in my collection, which was found by the late Dr. Lawrance, on the battle ground near New Orleans. The late Dr. Godman, also, lecturer on anatomy in this city, had a very beautiful preparation, taken from one of the inferior animals, illustrative of the effect of external injury in the production of ossific deposition—bony plates being thrown out on the external and internal surface of the chest, forming a complete case, and uniting several of the ribs closely together. A very interesting case is related by Mr. Giffard,* of a patient who died from peripneumonia, occasioned by an osseous substance, the fourth of an inch thick, six inches long and three broad, extending under the third, fourth, fifth, and sixth ribs of the right side. On the same side, towards the back, another bony substance was found connected to the bodies of the vertebræ and ribs. The patient had been troubled, for many years, with cough and difficult respiration, arising from the exostoses, which finally caused so much irritation as to destroy him. Sir Astley Cooper mentions the case of a lady who had a very large and painful exostosis seated on the ribs, behind the right breast. The patient was almost exhausted when he saw her, and died soon after; but no opportunity of dissecting the tumour occurred.

Very considerable ossified depositions are found, occasionally, upon different parts of the vertebral column. In some instances, bony flakes supply the place of the ligament covering the intervertebral substance; in others, the intervertebral substance itself is converted into bone, rendering the spine a solid inflexible mass. I have seen a preparation, exhibiting the complete union of every vertebra of the body, and constituting a solid pillar of bone from the head to the sacrum. In my collection, there are two specimens of several dorsal and lumbar vertebræ completely united by bone, instead of ligament; and

* Philosophical Transactions, vol. viii. p. 205.

the Wistar Museum contains a most beautiful preparation of caries in the bodies of ten dorsal vertebræ, with destruction of the intervening cartilages, where a splint half an inch thick and twelve inches long, covered with protuberances, has been thrown out on the anterior and right side of the spongy bodies, uniting them closely to each other, preventing deformity, and effecting a cure by firmly supporting the whole spine. Part of the spine of a horse belongs to the same collection, having the bodies of the dorsal vertebræ strengthened in a similar manner, by a bony splint, still more extensive. Freke has recorded the case of a boy, whose back and ribs were covered with bony projections, from the neck to the sacrum. "April 14th, 1736," says he, "there came a boy of a healthy look and about fourteen years of age, to ask us at the hospital, what should be done to cure him of many large swellings on his back, which began about three years since and have continued to grow as large on many parts as a penny loaf, particularly on the left side. They arise from all the vertebræ of the neck and reach down to the os sacrum; they likewise arise from every rib of his body, and joining together in all parts of his back, as the ramifications of coral do, they make, as it were, a fixed bony pair of bodice."*

All the bones of the pelvis are more or less subject to exostosis. The ilia, ischia, pubes, and acetabula of a pelvis in the Wistar Museum, are studded with tuberculated exostoses. They are particularly large and conspicuous, at the superior and inferior spinous processes of the ilium, and on each side of the outer surface of the pubes, over which thick bony masses, an inch long, project and unite with each other in a vaulted form, at the symphysis. Several bony plates, resembling the heads of large nails, are fixed upon each sacro-iliac junction, apparently serving the purpose of connecting the iliac bones firmly with the sacrum. An exostosis upon the inside of the pubes has occasioned death, by compressing the neck of the bladder and preventing the introduction of the catheter.† The *uterus* has been ruptured by an exostosis, seated behind the pubes. A case of this kind occurred, several years ago, in the practice of Dr. Dewees.‡ The patient died, and upon examination by the late Drs. Physick and Dewees, "the pelvis was found faulty at the superior part, by a *pro-*

* Philosophical Transactions, vol. ii. p. 252.

† See Boyer on the Bones, vol. i. p. 354.

‡ Coxæ's Museum, vol. ii. p. 412.

jection of bone or an exostosis; it was situated a little to the left of the symphysis pubis, and looked towards the base of the sacrum; it diminished the superior cavity of the pelvis in the direction of its small diameter about half an inch; it was sharp and pointed at its extremity. The projection of the bony process just mentioned, by diminishing the cavity of the pelvis, must be regarded as the remote cause of this accident. The child's head, enveloped in a portion of the uterus, rested against this point so long that inflammation and gangrene were the consequence. The efforts of the uterus continuing violent, and perhaps that violence increased by the difficulties which opposed them, eventually gave way, as its substance at this particular part was much weakened by the changes produced on it by inflammation, nay, the bony tumour acted somewhat like a cutting instrument." Although I am unacquainted with a case of the kind, it is easy to conceive that an exostosis occupying the cavity of the pelvis, even when it does not attain considerable bulk, may present great difficulties to the passage of the child during parturition. Portal seems to have entertained the same view when he says, "Indépendamment des vices du bassin provenant de sa conformation vicieuse, sa cavité en général et ses deux détroits en particulier pourroient être rétrécis par des exostoses plus ou moins grosses; il peut aussi se former des tumeurs de diverse nature dans le bassin même, dans la matrice ou dans les parties molles adjacentes, qui empêchent la sortie de l'enfant de cette cavité."* Sarcomatous and encysted tumours within the pelvis are by no means uncommon, and have proved so injurious by interrupting delivery, that out of eighteen cases recorded by different writers, it appears, one half the patients died and the greater part of the rest recovered imperfectly.†

Exostosis may occupy any portion of the thigh bone, but is seldom found either at its head or condyles. Every variety of the disease is occasionally produced. A femur in my possession is studded at different points, chiefly on the posterior surface, with numerous tuberculated exostoses of considerable size. There is, also, upon the same bone, a circumscribed exostosis, four inches long; commencing below the great trochanter and bulging an inch beyond the shaft of the bone. A very fine

* Cours d'Anatomie Medicale, tom. i. p. 374.

† See Merriman's Cases of Tumours within the Pelvis, in *Medico-Chirurg. Transact.* vol. x. p. 50.

specimen of lamellated exostosis is contained in the Wistar Museum. The femur is of extraordinary thickness (measuring in circumference eleven inches) uncommonly heavy, and covered with immense scales or osseous incrustations folded across each other and irregularly plaited like the skin of a rhinoceros. These masses extend from the trochanter to the condyles, and in some places are upwards of two inches long. The head and neck of the femur and condyles are of the natural size and free from disease. (See Plate XVIII. fig. 2.) Thirteen examples of exostosis of the femur are given by Daubenton,* in three of which the whole circumference of the bone is enlarged to the extent of nine and a half inches.—The work of Sandifort contains several tuberculated and circumscribed exostoses. Upon one bone a smooth tumour, four inches long, two thick, and shaped like a kidney, rises by a broad base, from the inner side of the thigh bone, near the lesser trochanter. In another specimen an exostosis of the same kind extends beyond seven inches; and in several others the tuberculated variety is distinctly marked.† Mr. Howship‡ mentions an exostosis, belonging to the collection at St. Bartholomew's Hospital of such astonishing magnitude as nearly to equal three feet in circumference and conceal the whole length of the femur. The spinous exostosis is rarely met with on the femur; at least I know of three examples only—two in the Wistar Cabinet, and one described and delineated by Cooper. In the former, each thigh bone, just above the condyles, is irregularly enlarged twice beyond its natural size; and from this protuberance several bony spires project. The longest grow from the inner side, run upwards and parallel with the shaft of the bone. (See plate XVIII. fig. 3.) In the case detailed by Cooper, an exostosis, from one to three inches long, occupied the thigh bone above the internal condyle, and was felt through the integuments and muscles about the size of the finger. When the patient walked, he felt what he described as a snapping in the part like a cord slipping from a pulley, which probably arose from the extension of the sartorius muscle and its sudden slipping over the swelling. When he placed the limb quite straight, he found a difficulty in bending it; and when bent, it was almost equally difficult to extend it:

* Description du Cabinet du Roi, tom. iii. p. 87.

† Museum Anatomicum, vol. ii.

‡ Medico-Chirurg. Transact. vol. viii. p. 97.

each flexion and extension producing a snapping noise, which could be distinctly heard.*

The tibia is extremely subject to exostosis. Among several specimens in the Wistar Cabinet, four, particularly, deserve notice. In the first, the bone is enlarged irregularly from the tubercle to the middle of the leg, three times beyond its natural size. The fibula is also increased in the same proportion and anchylosed with the tibia. In the second a circumscribed exostosis, the size of an egg, springs both from the tibia and fibula, about two inches above the ankle, firmly uniting, and at the same time forcing these bones out of their natural position. In the third, the superior and inferior extremities of the tibia and fibula are enlarged and anchylosed; the fibula, especially, including two-thirds of its superior extremity, is covered with very rough processes, and the bone nearly equals in size the tibia itself. In the fourth specimen, numerous spinous exostoses arise from each extremity of the tibia. Those attached to the upper end of the bone run downwards, while those seated near the ankle extend upwards nearly in a line with the tibia. Each extremity of the tibia is enlarged, as in the specimens of the same disease in the femur and humerus already described. (See Plate XVIII. fig. 4.) Many examples of exostosis of the tibia are found in different authors. Chesselden† has given a very fine engraving of a circumscribed exostosis, seated on the upper end of the tibia,—equal in size to a child's head. Sixteen specimens, varying in shape and size, are described by Daubenton.‡ The Museum of Sir Charles Bell, of Edinburgh, contains numerous specimens of the same kind.§ Several of the inferior animals are subject to exostosis of the tibia and metatarsal bones. The diseases called *splent* and *spavin*, so common among horses, are of this description. In my collection are two very beautiful preparations of the knee joint of the horse, affected with spavin, in which bony matter has been thrown out profusely, so as to resemble the tuberculated exostosis in the human subject.

The upper and lower extremities of the fibula are more subject to exostosis than the intermediate portions. There is a fibula

* Surgical Essays, p. 219.

† Osteographia, Plate LIII. p. 53.

‡ Histoire Naturelle du Cabinet du Roi, p. 93.

§ Description of the Anatomical Museum of the School of Great Windmill Street, 4to. p. 7.

belonging to the Wistar Museum, upon the upper end of which an irregular exostosis, as large as an egg, is seated. Each end of the fibula, belonging to the opposite leg, terminates in a bulb of considerable magnitude. In two fibulæ, in my possession, irregular exostoses cover the greater part of the bone, rendering each nearly as large as the tibia.

I have never seen true exostosis, either of the tarsal or metatarsal bones, and believe the disease to be equally uncommon in the toes. Two exostoses, projecting from under the nail of the great toe, are mentioned by Cooper, who removed one with a saw, on account of the pain it occasioned the patient. The same writer states that he has known half the foot amputated, on account of the exostosis, at the extremities of the metatarsal bones next the toes.

TREATMENT OF EXOSTOSIS.

In every true exostosis or simple enlargement from inordinate deposition of ossific matter, much may be done both by constitutional and local means. General remedies, especially when combined with rigid abstinence, exert a more powerful influence over local diseases than is commonly imagined. There is scarcely a tumour, however large or extensively involved, whether situated among vital parts or confined to the common textures of the body, which may not, by judicious management, be made to feel the operations of the absorbent system. By abstracting from the body its accustomed nutriment, the proportion to particular parts is diminished and regular demands are then made upon all those textures which act subserviently in the animal economy. Superfluous fat is removed from its cells and made to contribute to the support of the general system. In like manner, unnatural enlargements and morbid superstructures are changed or extinguished, and forced to renovate the waste which is perpetually taking place. A knowledge of these powers leads, in the hands of judicious practitioners, to very important results—such as are too often overlooked. The active aid of operative surgery, instead of being regarded with horror and as an exercise of skill often ostentatious and unnecessary, is frequently employed before general remedies are even tried, and resorted to under circumstances where benefit cannot be expected to result. Whoever attends a European Infirmary

will be struck with the diversity and multiplicity of operations, performed upon the most trivial occasions. Will it be credited, when I say that the illustrious father of American surgery, during a practice, both hospital and private, of forty years, and more extended than that of any other individual of our country, very seldom had occasion to resort to amputation? It may be asked what became of his patients? I answer, they have been cured by general and local means. "Doctor," said a late surgeon of the Pennsylvania Hospital, to a distinguished practitioner of a neighbouring city, "what would be done in your town with such a leg?" "We should cut it off," was the reply. "We can cure it *here* without," rejoined the other. In a certain London hospital," says Dr. Gregory, "a patient was under the care of the physicians on account of a very bad leg, which baffled their skill and appeared to them almost hopeless; they therefore requested a consultation of the surgeons, to examine the leg and to decide what was to be done with it. The surgeons accordingly met, examined it, consulted about it, and resolved, *nemine contradicente*, that the leg could not be saved, and ought to be cut off. They cut it off without delay. But strange to tell, the physicians at their next visit, on examining the patient, found to their great astonishment, the supposed hopeless leg as fast to his body as ever it had been. The puzzle was soon explained. It happened that the man had *two* legs, both of them very bad; one of them the physicians thought they could save, the other they despaired of. There being but a right and a wrong, it was not very marvellous that the consultation took the wrong. Both physicians and surgeons, I believe were a little disconcerted at that *quid pro quo*; and as it was thought rather a strong measure to cut off both the man's legs, they exerted themselves to the utmost and saved the leg which should have been cut off: so that after all the poor man was but one leg out of pocket. As I was not an eye-witness of this edifying transaction, it is proper to give some account of the genealogy of the story, which is very short and simple. I have it from a reverend clergyman, who had it from one of the physicians concerned, and who is now one of the most eminent of his profession in London. I know both the clergyman and the physician intimately; I know them both to be men of veracity and men of sense; and I have no doubt that the facts were just

as I have stated them.”* These remarks may appear, perhaps, irrelative, but I am satisfied of their importance, and shall be gratified if they tend to check the disposition, so prevalent among young surgeons, to use the knife; or contribute in a single instance to alleviate pain, or remove disease by milder or more appropriate means.

Wherever an exostosis may be situated, provided it be painful, grows rapidly, presses on some important organ, impedes the motion of a joint, or interferes with the flexion or extension of a limb, it will become expedient to interrupt its progress or remove it entirely. For this purpose we commenced by gradually abstracting from the patient his accustomed quantity of aliment, by prohibiting nutritive articles, whether solid or fluid; by obliging him to avoid spirituous, fermented, or stimulating liquors of every description, and by restricting him to diet in every respect adapted to his age, constitution and habits. It is impossible to lay down precise rules applicable to every case, since almost every individual is liable to have the natural actions of his body disturbed by causes which have no influence over the system of another. Many patients can live for weeks or months, on a little tea and a few crackers a day, without being as much debilitated as others who are allowed animal food and more nutritive drinks. Much, therefore, will depend upon the peculiar constitution of the patient, and this may generally be ascertained in a short time. It is a great mistake to suppose that old people cannot bear a system of abstinence, or that debility is necessarily associated with age. There are many persons extremely vigorous in advanced life, who can sustain with impunity deprivations sufficient to destroy younger and more delicate patients. It is true, however, that the systems of most old people sooner and more suddenly suffer from diminution of accustomed food, than those of younger ones. For this we should be prepared, and ready to substitute nourishment so soon as we perceive the system suddenly yield. By pursuing this plan steadily, and for a length of time, we shall often succeed in removing exostosis and other tumours of considerable magnitude, without the employment of other means; but in general, it will be necessary to administer purgatives every third or fourth day, or at stated periods, and to draw blood either from the system

* Additional Memorial to the Managers of the Royal Infirmary, p. 265.

or locally. Local blood-letting, if the tumour be inflamed or painful, will prove extremely serviceable. Leeches should be preferred to cupping, and twenty or thirty will be sufficient to detract several ounces of blood. They should not be applied over the most prominent or inflamed part of the tumour, lest ulceration follow their bites.—Besides these remedies, pressure, gradually and steadily applied, will act powerfully in promoting absorption. When the exostosis is seated upon the extremities, a firm compress supported by a roller will answer every purpose; but in certain situations, as on the cheek bones, it will be necessary to use a species of truss or an elastic spring, so constructed as to keep up moderate but constant pressure. Some tumours, however, will not bear even the slightest pressure, and if the patient is resolute enough to endure the pain, ulceration will be apt to follow—with increase of the disease. Sometimes pressure with adhesive straps, covered with sheet-lead and a roller, answers a useful purpose.

Blisters, kept open by savin cerate, have been extolled by some writers as efficacious in exostosis; but I have tried them in several instances without effect. In venereal exostosis or node, they are sometimes beneficial.

When these remedies fail, and the exostosis continues to increase, becomes more painful, interferes with some important organ, or endangers the patient's life, an operation may, perhaps, be necessary. It cannot, however, always be done. Anatomical considerations will sometimes prohibit it—at other times, owing to the duration and size of the tumour, so much irritation would be produced as either to destroy the patient or render the cure very tedious or doubtful. If the tumour is not very large, is of the circumscribed, tuberculated, or spinous varieties, and situated superficially, such incisions should be made as to expose its base to the action of Hey's saw, or the trephine. By the conjoint operation of these instruments I removed, several years ago, from the tibia of a boy, a circumscribed exostosis of considerable magnitude, which had resisted every other remedy. About the same period, I removed with success, and by similar means, a large exostosis from the outer condyle of the humerus of a young gentleman. But often the exostosis is so situated, that neither the trephine nor Hey's saw can act without injuring, materially, the surrounding soft parts.

To obviate this inconvenience, several cutting instruments,

within a few years, have been invented. Mr. Machell,* an English surgeon, has constructed a circular saw calculated to work beyond its semi-diameter and at a considerable depth, without interfering with the muscles. The saw is actuated by several wheels, enclosed in a case or conveyance, which are propelled by a winch or windlass. A pair of forceps are attached to the instrument in order to fix it to the bone and keep it steady while the saw is in motion. Having never seen this instrument, I cannot speak of it from experience; but if a proper estimate can be formed from the drawing and description, it would appear exceedingly complicated and expensive, and not calculated to answer, without great trouble, the purposes for which it was designed. The teeth of the saw, moreover, being placed on wheel-teeth or cogs, which work upon each other, must necessarily be injured or broken after a few revolutions. Again—unless the forceps be screwed with great force, so as to take a very firm hold of the bone, the saw cannot be made to work steadily, and more or less resiliency or titter must follow every attempt to set it in motion. Both hands of the surgeon being employed, one in moving the handle, the other in holding the conveyance, it will appear evident that without the aid of the forceps, the instrument, if it can operate at all, must do so under every disadvantage. It was on this account, perhaps, that Sir Astley Cooper failed in removing an exostosis from the femur with this machine, until he secured it by the forceps. “The saw was then attempted to be used,” says he, “without the forceps, but it could not be well fixed: the forceps were, therefore, added to it, and the bone was sawn through.” But there are many situations where these forceps cannot be applied, or if applied cannot render the saw steady. The circular saw of Mr. Griffith,† although extremely simple in construction, possesses so little power as to render it unfit for the most common purposes, and is decidedly inferior to that of Hey. The chain saw of Dr. Jeffray,‡ of Glasgow, appears to me calculated for no other purpose than that for which it was originally designed—the removal of carious joints; but under any circumstances it is extremely liable to twist or break; as I have several times

* Edinburgh Medical and Surgical Journal, vol. xi. p. 273.

† Surgical Essays, p. 218.

‡ Jeffray's Observations on the Excision of Carious Joints, p. 175.

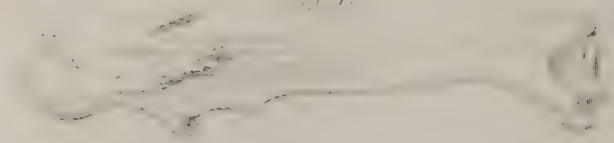
proved in operations upon the dead subject. The cutting plyers of Liston are very efficient for certain purposes.*

Sir Astley Cooper has given the history of five operations for the removal of exostosis. The first was of large size and formed like an inverted pyramid, the apex of which was attached to the tibia; it had been growing forty-four years. An elliptic incision was made through the integuments, and the tumour removed by the amputating saw, without much difficulty. In the second case, a spinous exostosis was taken from near the inner condyle of the thigh bone of a young lady eleven years old. The limb had been painful as low as the heel, and when the patient "attempted to run, she felt a snap upon the swelling, as if a cord had slipped out of its pulley, which was owing to the tendon gliding over the projecting part of the bone." The tumour was separated by Machell's saw, and the irregularities that remained smoothed by the bone nippers. The circumstances of the third case were nearly similar to those just detailed. In the fourth case, an exostosis of the fibula, involving the fibular nerve, thereby producing paralysis of the peroneal muscles, as well as the flexors of the foot and extensors of the toes, was removed by Hey's saw. In the fifth case a large exostosis, growing from the outer and left side of the pubes, attended with great pain in the hip, above and below the knee, and in the foot, was separated by Machell's and Hey's saws. These patients were all cured except the fourth, who was relieved of pain but not of paralysis.

In 1815, a gentleman from the eastern shore of Maryland, applied to me on account of a circumscribed exostosis which occupied the middle of the os frontis, had been growing for years, arose without evident cause, attained the size of a large egg, and was solid and incompressible. Ulceration possessed the most prominent part of the tumour, which was supposed by the patient to be cancerous. As various remedies had long been tried, ineffectually, an operation appeared to furnish the only prospect of relief. An incision, traversing the whole swelling, was made, and the integuments turned aside, so as to expose the base of the exostosis, which was then removed with difficulty, by Hey's saw. The substance was reticulated, and did not differ, apparently, from that of sound bone. The internal table of the skull

* See Edinburgh Journal, No. lxvi., January, 1821, p. 155.

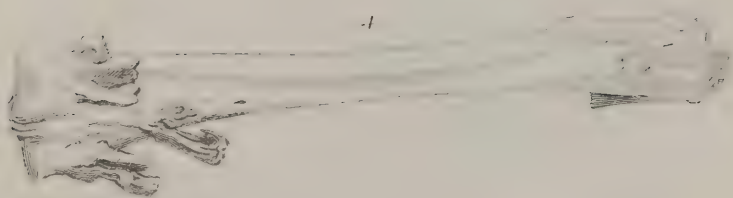
Fig. 1.



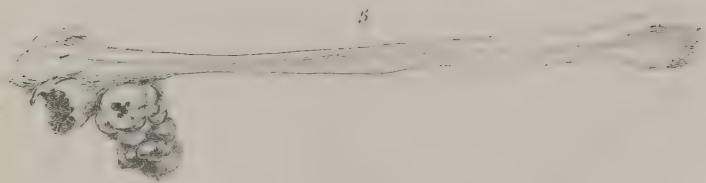
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4



5



2



remained entire, the patient recovered in four weeks, and the complaint has never returned.

An exostosis may be removed from almost any bone in the body; provided it does not embrace the whole circumference, or extend throughout the length, as in the lamellated variety. (Plate XVIII. fig. 2.) When a very large bony tumour surrounds the arm, forearm, thigh or leg, and an operation becomes necessary, nothing less than amputation will probably answer. There are certain situations, where it would be difficult, if not impossible, to remove even a circumscribed exostosis occupying part of a bone. Thus, such a tumour growing from the inside of the pubes or sacrum, interrupting the flow of urine, or impeding the passage of the child in parturition, could not perhaps be reached or extracted. In the latter case, however, so much danger, probably, would not result; as an experienced accoucheur would attempt to turn the child and avoid the projection. The removal of an exostosis arising from the inner surface of the ribs, as in the case related by Giffard, to which I have already referred, would be attended with great difficulties. The same may be said of the disease when seated on the spine, except the spinous processes alone should be involved; in which case an operation might be very beneficial; as shall be shown hereafter, when I speak of an *osteosarcomatous* tumour, of monstrous size, which I removed in October, 1818, from the spine of a young gentleman in Maryland. An exostosis growing from the inner table of the skull, and pressing upon the brain, might perhaps be removed; but not with much prospect of success. This would arise less from the difficulty of the operation itself, than from the exposure and subsequent inflammation of the brain and its membranes. Cases may possibly present, however, where the surgeon would be justified in resorting to an operation;—as in the examples recorded by Howship* and Wadd,† of ossific matter deposited between the tables of the skull, distorting the bones, and producing insanity by pressure on the brain. The successful issue of the interesting operation by Keate‡—the removal of a bony tumour involving the lamellæ of the greater part of the os frontis and containing an enormous collection of hydatids, should form an additional inducement to saw away any bony mass

* Medico-Chirurgical Transactions, vol. viii.

† Malformation, and Diseases of the Head, by Wm. Wadd, 4to. 1819.

‡ Med. Chir. Trans. vol. x.

encroaching upon or interfering with the functions of the brain. An exostosis of the lower jaw, involving its circumference, may be removed by cutting through the bone on each side of the tumour, and completely insulating it. The void will afterwards be filled by callus, or the cut extremities of the bone so firmly united by ligamentous substance as to render the jaw nearly as useful as ever. Again, if the tumour should be situated at the symphysis, the jaw could be readily cut through on each side of it, and the ends of the bone pressed together and united, as in Dupuytren's celebrated operation for artificial chin.* Great deformity, however, must necessarily result from such a proceeding, and in many instances I think the operation would be totally unnecessary, and should be supplied by the following mode, which I adopted several years ago, in the following case. A poor woman had a tumour, partly fungous, partly bony, the size of a large orange, which sprang from the symphysis of the lower jaw, on the inner side, pushed before it several teeth, and so filled the mouth as nearly to prevent swallowing, and render articulation almost unintelligible. I divided, with a strong curved knife, the alveolar processes, (softened by caries,) on each side of the symphysis, nearly to the base of the jaw, separated the tumour from its attachments, and controlled the hemorrhage by ligatures and the actual cautery. Upon examining the cavity or bed occupied by the tumour, I was surprised to find how much of the jaw had been absorbed—a small portion of its base only remaining on each side of the symphysis. Great as the vacuum was, however, it was soon filled by granulations and ossific depositions, and in a few weeks the patient entirely recovered. Nothing could have been easier, in this case, than to have imitated Dupuytren, by cutting away the base of the jaw and bringing together its ends; but if I had done so the patient would not only have been horribly disfigured, but mastication and speech greatly injured by the teeth and tongue being thrown from their natural situation.

Should an exostosis occupy the orbit and displace the eye, it may be removed, provided the base be not very large; not by following the practice of Lucas†—cutting down upon the tumour and then leaving it to drop off by caries—but by applying cau-

* See Dict. des Sciences Medicales, tom. xxix p. 430.

† See ante.

tiously Hey's, or a small circular saw as near to its base as possible. If the tumour cannot be reached by a saw, it may, perhaps, be made to exfoliate by the application of acids or caustics. An interesting case illustrative of the beneficial effects of caustic is related by Louis.* A woman, thirty years of age, suffered from a fistula lachrymalis which resisted every remedy. The bones became enlarged, and an exostosis, the size of an egg, occupied the os planum and internal angular process of the os frontis. The eye was forced from its socket, and hung over the cheek. Brasant, the surgeon who attended the patient, applied caustic to the exostosis; suppuration followed, and in three or four months the greater part of the tumour exfoliated, the eye resumed its position, and a cure was soon completed. Neither the saw nor caustic, however, will often be required for exostosis of the orbit, as the disease must be considered rare. Tumours of a different description—steatomatous, encysted, and sarcomatous, frequently occur, and become so large as to displace the eye. Several such cases I have seen. I know a gentleman at the present time, whose eye is pushed to one side and almost squeezed from the socket by an encysted tumour;—which could be removed with success, and with the utmost facility. In the year 1818, I took from the orbit of a patient, under care of Dr. Coulter, of Baltimore, a sarcomatous tumour, which grew from the socket, compressed the eye, and in time would have destroyed it. Similar examples are related by Trincavelli, Peau, Astruc, Bertrandi, Bonetus, Louis, Le Dran, St. Ives, Hope, Brocklesby, Rodman,† &c.

A very large tuberculated exostosis, as irregular as an artichoke, I removed in the winter of 1836, from a lad by the name of Tyrrell, from Georgia. It was situated between the hamstrings, and grew from the heads of the tibia and fibula, to which it was attached, in some places, by a broad base, in others by a narrow neck. So firmly was it wedged between the bones, and confined by tendons and muscles, as to render it impossible to remove it *en masse*. I was obliged, therefore, to make several sections with Hey's and other saws, before I could extract it from the irregular cavity in which it was imbedded. The wound

* *Memoires de l'Académie de Chirurgie*, tome xiii. p. 277.

† See Shenkius; *Memoires de l'Académie*; *Sepulchretum Anatomicum*; *Maladies des Yeux*; *Philosophical Transactions*, 1744; *Medical and Physical Journal*; *London Med. Obs. and Inq.*

healed rapidly, and the boy recovered, in a few weeks, the perfect use of the limb, notwithstanding the division of several tendons and ligaments, and the extirpation of the upper extremity of the fibula. There was a strong tendency to bony enlargements in other parts of his body.

There is another operation for the removal of exostosis, which deserves to be tried, whenever the situation of the disease will admit of it, before we resort to extirpation with the saw, or to amputation of a limb. This consists in the separation of the periosteum from the tumour—thereby, in a measure, depriving the part of vascularity and promoting its absorption. The remedy was proposed, some years ago, by Sir Astley Cooper, and communicated to me in a letter, by Sir Charles Bell, of London. “Sir A. Cooper told me,” says Sir Charles, “last night at the Anatomical Society, that he finds the largest tumours of exostosis absorbed, by simply cutting down upon them and separating the periosteum from the face of the bone by the handle of the knife.” The older surgeons were in the habit of performing the same operation in cases of venereal exostosis or node, sometimes with success, but frequently without any benefit whatever.

Consult Cooper and Travers’s *Surgical Essays*, part i.; Wilson’s *Lectures on the Diseases of the Bones and Joints*, p. 269; Boyer’s *Treatise on Surgical Diseases*, by Stevens, vol. ii. p. 159; Mayo’s *Outlines of Pathology*; Wickham on *Diseases of the Joints*.

SECTION VI.

SPINA VENTOSA.

SIR ASTLEY COOPER and some other writers have, improperly it appears to me, described this disease as a species of exostosis. It differs from it in many respects. The exostosis is firm, solid, and incompressible. Spina ventosa, on the contrary, usually attains a much larger bulk than exostosis, involves the whole circumference of a bone, and when dissected, is found to con-



View of the Arm and Hand.

sist of a mere osseous shell, perforated with numerous holes, and containing sometimes a thin sanies mixed with loose portions of lymph, or of a substance resembling cheese. It is to this disease Mr. John Bell* alludes when he says, "The solid bone, whether radius or thigh bone, is annihilated, and a mere shell of osseous matter substituted in its place, and that in a manner so peculiar, that it must seem to the unintelligent observer, as if the small and solid bone had been expanded into an extensive and flat plate of osseous substance, whereas, the process is in truth very simple and very intelligible. The bone dies piecemeal of ulceration, or what, in technical language, is termed caries, and is conveyed away by absorption; but the bone being dead, the surrounding membranes—namely, the periosteum and tendinous expansions, which once formed a part of its system of circulation, continue still alive, and ready to secrete new bone; and thus it happens, that while carious abscess preserves a large cavity full of foul matter, the surrounding membranes continue secreting bone, which, like a shell, thin and expanded, covers this cavity, and forms the walls of the tumour, of which some part is composed of thin expanded bone, resembling a cranium, some of cartilage, some of thickened membrane; and this shell is formed in proportion as the original fabric of the bone is destroyed."

The cylindrical bones are commonly the seat of spina ventosa; though I have met with the disease, in two or three instances, among the flat bones. The finest specimen I have ever seen, was sent to me a few years ago by Dr. Stevens of New York. It occupied the radius of the left arm, and the bone, nearly from the elbow to the wrist, was expanded into one or more irregular shells, the size of a cocoa-nut, and contained a thin steatomatous matter. (See Plate XIX.)

TREATMENT OF SPINA VENTOSA.

When the smaller bones, such as the phalanges of the fingers and toes, are affected with spina ventosa, a cure may sometimes be produced by moderate, long-continued pressure directly over the tumour; at other times, I have succeeded by making an opening into its cavity, and by stimulating injections, or by cutting

* Principles of Surgery, vol. iii. p. 59.

instruments, exciting such a degree of irritation, as to cause it to fill up with granulations. In this way I once cured an obstinate spina ventosa of the lower jaw, about the size of an egg. Should any of the large cylindrical bones be involved, and the tumour attain a large size, nothing less than amputation will be likely to answer. This was successfully resorted to in the case of Dr. Stevens' patient.

See Boyer's Treatise on Surgical Diseases, vol. ii. p. 167; J. Bell on Tumours, vol. iii.; Boyer's Lectures on the Diseases of the Bones, by Farrell, vol. i. p. 364; B. Bell's System of Surgery, vol. i. p. 305; Hey's Surgery; Sir Benjamin Brodie, in Med. Chir. Transact.

SECTION VII.

OSTEO-SARCOMA.

THE older surgeons employed the terms *Osteo-Sarcoma*, *Osteo-Sarcosis* and *Osteo-Steatoma*, to designate such tumours as were formed by the irregular admixture of bony, fleshy or fatty particles. By the moderns, *osteo-sarcoma* has been retained, as more expressive than the others.

This disease may attack any of the bones, but the long bones of the extremities are commonly affected. According to Boyer,* the os innominatum is more subject to the disease, than any other bone in the body. The progress of osteo-sarcoma varies in different cases. Sometimes, a long-continued, deep-seated, lancinating pain, occupies some part of the bony system, long before any tumour or swelling is evident. At other times, a distinct tumour is perceptible from the first, gradually increases, and is not painful or inconvenient until it acquires considerable bulk and takes on inflammation. The pain is then extremely severe. The form of the tumour is either smooth and circumscribed or irregular: for the most part, the general swelling is studded over with knots or protuberances of various dimensions: the apices of which, in the advanced stages of the dis-

* *Traité des Maladies Chirurgicales*, tom. iii.

ease, are apt to ulcerate and discharge a small quantity of thin, fetid matter. Often, however, the whole tumour becomes enormous, and extremely ponderous, without the slightest ulceration of the integuments. When examined by the touch, the tumour feels solid and incompressible, or, if any evidence exist of fluctuation, it is only at particular spots, and is even then very indistinct. Old persons are seldom subject to osteo-sarcoma: I have met with two instances, however, in which the disease occurred in patients beyond the age of seventy. When young persons are attacked, a perceptible alteration is soon evinced in their general health and appearance. They become sallow, thin, and debilitated; and the bowels are alternately constipated and relaxed. Not unfrequently, a cough, and tightness of respiration, are constant and very troublesome attendants. In the advanced stages of the complaint, and especially when the tumour is large, ulcerated, and sloughy, hectic fever, and all its consequences, gradually undermine the strength of the patient, and finally destroy him. In several instances which have fallen under my notice, the patient has died from confirmed phthisis pulmonalis.

When the structure of osteo-sarcoma is examined by dissection, several interesting circumstances are developed. The integuments being raised, the muscles and tendons are found removed from their natural situation, and spread out and thinned to such an extent, as to cover a much larger surface than they usually occupy. The vessels and nerves of the part are also raised, and made to approach the surface of the tumour; to this surface the periosteum will be found closely to adhere, and to give a firm, dense, pearl-coloured covering, which is with great difficulty separated from the diseased bone. The bone itself in immediate contact with its investing membrane, will be found smooth on the surface, and either uniform and regular, or else disposed in lobulated masses of different forms and sizes. Sometimes, these are extremely regular, of a rounded form, and resemble very much a cluster of grapes. At other times, several large masses are joined together, and present the appearance of an artichoke, or protuberant potato. When the bony texture of these tumours is cut, forcibly separated, or crushed, a number of irregular cells are brought into view, containing either a thick, cheesy, lardaceous, medullary matter, or else a gelatinous semi-transparent fluid, which oozes out of its own accord, or can be removed by mechanical means, or by maceration,—leaving the

sides of the cavities lined by a very fine and delicate membrane. The morbid tissue of bone will then be found to consist of innumerable spicula, disposed in endless variety of ramifications, and shooting out into fantastic forms, resembling some species of coral, or assuming the shape of certain vegetable productions. I have in my possession a very fine specimen of osteo-sarcoma, of several pounds' weight, taken from the upper jaw of an ox, and presented to me by an intelligent physician, Dr. Townsend, of Maryland, to whom my cabinet is indebted for other contributions. In this specimen, the cells which I have described, and the arrangement of the bony spicula, are uncommonly well displayed, owing to the magnitude of the tumour and the original texture of the bone upon which it is reared.

The origin of osteo-sarcoma is enveloped in great obscurity. It appears, sometimes, as an hereditary disease, and as such, has been transmitted in succession to numerous individuals of the same family. A very remarkable case of the kind is recorded by Boyer, in which the father, brothers, sisters, nephews, and children of a woman thirty years of age, and who otherwise enjoyed good health, had from their earliest infancy, bony tumours on the tibia. The patient herself had similar tumours on both tibiæ, on the left humerus, and on the middle of the left thigh. All remained stationary, and were of small size, except the one on the thigh, which gradually increased, became particularly large and painful after her marriage, and finally increased to such an extent, as to weigh twenty-one pounds, and render amputation necessary. Upon dissection, all the characters of osteo-sarcoma were distinctly marked. In many instances, this disease has been decidedly traced to a blow, to a jump from a height, to fracture, and other external injury; but there is great reason to believe, in most instances, that it is connected with some constitutional affection, since we meet with many cases in which, after removal of the tumour or amputation of a limb, other parts of the body have been attacked in a similar manner, or else the patient has been carried off in a short time, by some disturbance of the vital organs. In several cases presented to my notice, patients have undergone operations for osteo-sarcoma, and have so far recovered in a short time, as apparently to enjoy excellent health, when suddenly their strength has declined, hectic fever has supervened, a pain in the breast with cough and purulent expectoration, has taken place, and death has soon followed from phthi-

sis pulmonalis. A case is recorded by Dr. Baillie, in his *Morbid Anatomy*, of a person who had a very large bony tumour formed around one of his knees; this was removed at St. George Hospital by Mr. Walker, by amputation of the limb; very soon after, a difficulty of breathing began, occasioned by part of the lungs being converted into bone, and by a very considerable deposition of bony matter on the inside of several of the ribs, which caused the patient's death.* These circumstances would seem to favour the idea suggested by Boyer,† Richerand‡ Callisen,§ and some other writers, that osteo-sarcoma is, in reality, a cancerous affection of the bony tissue, and as such, may give rise to all the consequences which are liable to result from a similar disease of the soft parts. It is to be hoped, however, admitting this view of the subject to be correct, that the disease is not always so deeply engrafted upon the constitution, as necessarily to give rise, after extirpation or amputation, to a similar affection of the pulmonary system, or any other of the vital organs. How far scrofula can be considered as giving rise to, or as connected with osteo-sarcoma, as it is known to be with some other affections of the bones, remains yet to be determined.

. TREATMENT OF OSTEO-SARCOMA.

Before an osteo-sarcomatous tumour has attained a large size, it may be removed, possibly, by local and constitutional remedies, without the aid of an operation. Leeches applied to the part itself, or its vicinity, will be found useful. Blisters, also, often repeated, and kept open by savin cerate, will prove still more beneficial. As a constitutional remedy, Sir Astley Cooper|| has extolled the exhibition of oxymuriate of mercury, combined with the compound decoction of sarsaparilla, a medicine which has long been used in France, and in this country, with the happiest effects, in the treatment of various diseases, especially chronic ulcerations and tumours of different kinds. Low diet, conjoined with purgatives, must likewise be had recourse to, and perhaps

* Wilson's *Lectures on the Bones and Joints*, p. 274.

† *Maladies Chirurgicales*, tom. iii. p. 587.

‡ *Nosographie Chirurgicale*, tom. iii. p. 121.

§ *Systema Chirurgiæ Hodiernæ*, vol. ii. p. 204.

|| *Surgical Essays*, p. 183.

moderate pressure, steadily applied to the tumour, may prove useful. When these remedies fail, an operation will become necessary. In many instances, nothing less than amputation will answer, inasmuch as the whole circumference of a bone is involved in the disease. Great care should be taken, therefore, to ascertain the extent and connexions of the tumour, as without just views in this respect much mischief and unnecessary pain and hazard to the patient may result. Mr. John Bell has related the case of a labourer, forty years of age, who had a tumour of enormous size, and of anomalous character, partly cartilaginous and partly solid, occupying two-thirds of the forearm from the wrist upwards. The hand was sound; the fingers and wrist could be easily bent; and the tumour seemed to move so freely, that a surgeon of skill and learning was induced to undertake its extirpation, in hopes of saving the hand and joint. "The poor man having willingly assented to any operation, however lingering or painful, which might save his hand, the dissection was carried all round the tumour, and into its central parts, before the surgeons present were undeceived. As the radius turns vertically like a spoke or spindle, it turns without any apparent motion, except in the parts connected with its lower end; the hand turns freely along with the radius, so that we never suspect, till we become acquainted with anatomy, that it is by the spoke-like motions of the radius that the hand moves; it seems moveable in itself, by its own immediate joints. This tumour, in like manner, moved easily; could be turned upwards or downwards; so that the surgeon never once suspected that the motion was in the radius, or that the tumour was fixed, and made a part of the bone. It seemed moveable, and, doubting, he began to extirpate it by drawing a long incision round its root, on the side of the ulna: but finding it difficult, with this limited incision, to dissect the tumour, he prolonged the incision, continuing it over the back of the hand to the knuckles, in the direction of the extensor tendons. He then dissected more freely, and continued separating the skin from the tumour, till he came to a thick and solid sac, which seemed to consist of the muscular fibres and aponeurosis of the pronator quadratus muscle. He continued this dissection, separating this thick and solid sac from the interosseous ligament, till he could go no further. Finding that it terminated in a solid and osseous basis, he now plunged intrepidly into the heart of the tumour. In cutting into the heart of the tumour,

he found that he had opened a very large sac, not firm only, but osseous; but as he was penetrating into the tumour at one side, he continued still unsuspecting, and persevered in dissecting away what he imagined to be a common tendinous sac, ossified only at certain points; he made thus a large opening into the tumour, felt its cavity full of loose and fatty bodies, pushed his finger under the extensor tendons into the deepest part of the sac, began to hook out the fatty tubercles with his fingers, and at last baling it out with his hand, hooking with his finger, and catching the fatty masses in his palm, he so far entered the cavity as to be able to search with his fingers in every direction, and then he found to his utter confusion, the ball of the carpus formed by the scaphoid and lunated bones, at the bottom of the cavity bare. He was now, for the first time, undeceived, and knew what sort of disease he had to contend with; he was now conscious that the radius was diseased; the joint destroyed; the original bone ulcerated. He felt distinctly that the ball of the carpal bones originally opposed to the lower end of the radius, was now, by the destruction of the radius, left naked; and, in fine, that the wrist was irrecoverably ruined. There was no going on with the operation, and no stopping here; he therefore explained to the patient, who had borne this severe and long-protracted dissection with great composure, the necessity of amputating his hand, which he submitted to with equal resignation.”*

The above case is calculated to show, in a striking manner, with how little prospect of success we can undertake to remove an osteo-sarcoma of any magnitude, involving the whole circumference of a bone; but it still remains a question, whether such a tumour, while in its incipient state, of small size, and seated on one of the bones of the forearm or leg, might not be successfully extirpated by sawing through the sound bone above and below its margins. The extremities of the diseased bone, would eventually, perhaps, be filled up or connected by adventitious ligaments, and so much support afterwards given by the sound bone, which would act as a splint, as to render the limb sufficiently useful for most purposes. Much, however, must necessarily depend, in such a case, upon the precise situation of the tumour; if closely connected with a joint, the operation would be attended with risk, and in the end would, perhaps, prove unsuccessful, or give

* Principles of Surgery, vol. iii. p. 64.

rise to subsequent amputation. It will appear from what has been said, that the treatment of osteo-sarcoma must be different in many respects from that of exostosis; that we cannot extirpate the former with the same success as the latter; and that, in many instances, owing to constitutional disturbance, all our operations will prove unavailing. This remark will even apply to amputation, for it has been decidedly ascertained, that the lungs and other important internal organs, have been attacked, in a very short time after the removal of a limb affected with the disease. To guard against such unpleasant consequences, our only resource is to continue the constitutional treatment recommended, *after the operation*, and to substitute an issue in the vicinity of the part from which the tumour has been removed.

Experience has long ago taught me, that, without precautions of this kind the patient's chance of recovery will be very much lessened. It appears, too, that the very ample and extended observations of Sir Astley Cooper have taught him the same lesson, if we may judge from the hint contained in his essay on "*Fungous Exostosis*," a term apparently employed by him to designate osteo-sarcoma. "The operation of amputation," says he, "after constitutional means have been employed, and the continuance of these constitutional means after the operation, hold out the chief hope of safety; for amputation without these will do no more than to avert the blow for a season."* As a local remedy for osteo-sarcoma, Sir Astley was induced to try the effect of cutting off the supply of blood from the tumour by tying the arteries which supplied it. The operation was accordingly performed in two cases, but without success; the current of blood being temporarily diminished, but returning in a short time with its accustomed force.

Many of the foregoing remarks will be illustrated by the following cases, which have occurred, at different periods, in my practice.

CASE I.

On the 28th of January, 1816, I was called to Washington, to visit Master W. M., aged sixteen, in consultation with the late Drs. Shaafe and Worthington, two distinguished physicians of that place. I found the right leg of the patient occupied by

* Surgical Essays, p. 186.

a large elastic tumour, which extended from the outer ankle along the course of the fibula, to within three inches of the knee. To the touch it was firm and incompressible, but at the same time slightly elastic, somewhat irregular, inflamed on the surface, and divided into two considerable lobes about equal in size. When handled, a distinct crepitation could be perceived near the ankle, and the whole tumour admitted of so much motion as to convey the idea that it was seated on the fibula, not identified with it. A deep-seated, severe lancinating pain was constantly present, and not only pervaded the whole diseased mass, but extended up the thigh, and rendered locomotion very difficult. The complexion of the patient was of a pale, yellow, cadaverous hue, and his skin studded with small, irregular, tuberculated bumps. The lymphatic glands of the neck were slightly enlarged, and those of the groin of the diseased limb thickened and painful. For several weeks he had laboured under hectic, and was much reduced.

Upon inquiry I ascertained that a hard swelling, the size of a marble, had occupied the middle of the fibula from early infancy; that in July, 1815, while indulging with his companions in vehement exercise in leaping, the patient experienced for the first time an acute and sudden pain in the small lump; with great difficulty he was able to walk home, and then discovered that the lump was larger than usual, and inflamed. The inflammation increased from that period, the tumour augmented slowly, was never entirely free from pain, and in a few months presented the appearance described.

To save the limb was altogether hopeless; amputation was therefore determined upon; and I performed the operation without delay. The patient recovered in a few weeks, grew fat and robust, and apparently soon enjoyed excellent health. This continued for eight months without intermission. About this period he made a visit to his friends at Baltimore, and while walking in the streets was suddenly seized with difficulty of breathing, and was so overcome by debility as with difficulty to reach home. From that moment he was confined to his bed, suffered from continual cough and hectic, and died in a few weeks with all the symptoms of confirmed phthisis pulmonalis.

Immediately after the amputation, the diseased leg was examined in the presence of the consulting physicians. Upon removing the integuments, the muscles were found spread out on

the surface of the tumour, and considerably extenuated and altered in the texture. Under the muscles the two chief lobes of the tumour were very conspicuous, and covered by a dense compact shining membrane, which was with difficulty separated from the bone. The bony tumour was found to consist of the greater part of the fibula, expanded into a large, porous, spongy mass, filled with an infinite number of cells of different dimensions, and separated from each other by ridges or partitions. These cells contained a fleshy, and in some instances, a steatomatous-looking matter. That portion of the fibula naturally attached to the ankle was carious and disjoined, had lost all traces of its original appearance, and was so loosely connected with the surrounding parts as to give considerable latitude of motion to the lower tumour, and produce that crepitation which had been observed antecedent to the operation. The upper end of the fibula, to the extent of two inches and a half, was free from disease; the rest was totally disorganized and ruined. The tibia was perfectly sound. The whole tumour, including the leg, measured at the most prominent point twenty-four inches in circumference. The fibula, when prepared and dried, lost a great part of its bulk and weight, and now resembles a vegetable production. A model in wax was taken from the preparation, while recent, from which a drawing has been made, as represented in Plate XX. A view of the dried bone is also given in Plate XXI.

EXPLANATION OF PLATE XX.

- A. A. A. A. The tumour opened to display its structure.
- B. Extensor communis.
- C. Tibialis anticus.
- D. Peroneus longus thrown from its natural situation.
- E. The tibia.
- F. The fibula.
- G. The tendons of the peronei muscles.
- H. The skin turned back.
- I. The upper tumour covered by a thick membrane.

PLATE XXI.

REPRESENTS THE SAME PREPARATION DRIED.

- A. The upper end of the fibula.
- B. B. B. The bony interstices, and reticulated structure of the tumour.



Case of "H.C."



CASE II.

A man upwards of sixty years of age, in the employment of the late honourable Charles Carroll, of Carrollton, had for several years, a tumour as large as a child's head, seated on the ribs, about the middle of the left side of the chest. At the request of Mr. Carroll, I examined the tumour in consultation with his attending physician, Dr. Matthews. The patient stated, that fifteen years before, he had received a kick on the chest from a mule; that soon after a small lump arose upon the injured part, which slowly increased, unattended with much pain, and so little inconvenience as to enable him to attend constantly to his occupation—that of a gardener. For several months, however, before I saw him, the pain, together with the magnitude of the tumour, prevented him from engaging in any business, and rendered him anxious to obtain relief.

To the touch, the tumour was firm and unyielding, except at particular spots, where it was soft, and seemed to contain a fluid. The whole mass could be readily moved for some distance under the skin, so as to convey the idea of a sarcomatous excrescence, loosely attached to the surface of the ribs. Under this impression it was determined that it should be removed. On the 1st of March, 1817, I commenced the operation in presence of Drs. Matthews, Denny, and Richardson, by dividing the integuments and muscles on the chest, so as to expose the tumour completely to view. This I found covered with a strong pearl-coloured cyst, in attempting to penetrate which, the knife encountered considerable resistance from spicula of bone. The nature of the disease now appeared evident, and I determined forthwith, to penetrate the base of the tumour, and elevate it gradually from the surface of the ribs. In proceeding, however, in the dissection, I soon discovered that all the ribs at the margins of the tumour were annihilated by caries, or else expanded into a spongy, porous mass, and in fact identified with the tumour itself. Being satisfied of this fact, and well assured that the ribs beneath the swelling were extinguished, I resolved to cut through each, at the points connected with the circumference of the tumour. This I accomplished, though with considerable difficulty, by means of a strong scalpel, and at last succeeded in removing the whole diseased mass from the surface of the pleura—leaving the cavity of the chest separated

from the tumour only by the intervention of that membrane, and exhibiting a circular opening among the ribs, upwards of six inches in diameter. Little or no hemorrhage took place, but the patient appeared to suffer extremely during the extensive, and necessarily protracted dissection. The integuments and muscles were replaced in their former position, and secured by adhesive straps and bandages.

Upon examination of the morbid structure, after its removal, all the characters of *osteo-sarcoma* were distinctly marked. The whole bony tissue was converted into cavernous cells, which were loaded with a mixture of fleshy and steatomatous matter. The bony ridges or spicula traversing the mass in various directions, were less firm than usual, and rendered the tumour so weak and vacillating, as to afford that mobility so conspicuous before the operation.

As the patient resided at the Manor, a considerable distance from Baltimore where I then lived, I did not see him after the operation; I was afterwards informed, however, by Dr. Matthews, that the wound healed in a short time, and that, for several months, his general health was better than it had been for years before, when suddenly a cough and dyspnœa appeared, which soon terminated in phthisis pulmonalis, and quickly destroyed him.

CASE III.

D. M., a sea-faring gentleman, consulted me in 1818, respecting a large, irregular, incompressible tumour, seated upon the ribs and spinous processes of the vertebræ, and extending from the neck quite down to the lower borders of the scapulæ. The tumour had been growing several months, and originated from a blow upon the back of the neck. It was of an oblong shape, and lobulated, and so large as to be very conspicuous beneath the patient's clothes. It had never been painful, and could be rudely handled without any unpleasant sensation being experienced. Completely identified with the spine and ribs, its base was immoveable. The surface was covered with numerous veins slightly varicose and tortuous.

As the character of the tumour was somewhat anomalous, I requested the patient to show it to some other practitioners; most of whom decided that it was sarcomatous. From its

stony hardness, want of sensibility, and irregular growth, I myself believed it to be composed chiefly, if not entirely, of bony particles. Under this impression I advised its removal, and provided such instruments as were best calculated to overcome the difficulties necessarily to be encountered. On the 22d of October, the operation was performed in presence of Drs. Davidge, Owen, and several medical students. I made a longitudinal incision over the most prominent part of the tumour, commencing above its margin at the neck, and extending down below its base on the dorsal vertebræ. The skin being dissected up, the trapezius muscle, on each side, was exposed fairly to view; these I also separated, at their connexion with the spinous processes, and folded back so as to expose the diseased mass; which now appeared completely enveloped in a dense, shining fibrous membrane, elevated in numerous places, by rounded bumps or tubercles, adhering to each other, and resembling a cluster of grapes. I next attempted with a strong scalpel, to remove the tumour itself; so firm, however, was its texture, that the edge of the knife was broken in every effort to penetrate it. The amputation saw was then resorted to, but finding it difficult, without wounding the surrounding soft parts, to apply it horizontally, I determined, at the suggestion of Dr. Davidge, to divide the tumour into two equal parts, by making a cut perpendicular to its surface, as far as the spinous processes. By this ingenious expedient, I was able, with a chisel placed in the fissure made by the saw, to force off one half of the tumour. The other half was then readily removed by applying the saw horizontally to its base. To smooth off the irregularities that remained, and to detach several insulated portions of the tumour, situated about the ribs and vertebræ, I made free use of the bone nippers, or cutting forceps, contained in the amputating case, and found them so extremely serviceable that I have since employed them repeatedly in the extirpation of different bony excrescences. The patient bore the operation with great composure, although it was evident he suffered immensely, both from the extensive dissection of the soft parts, and from the unavoidable laceration and destruction of the tumour itself. This was still further evinced from the circulation being so weak at the wrist immediately after the operation, as scarcely to be perceptible; nor was reaction completely established for several days. Indeed, so great was the shock sustained by the nervous system,

that for several days I was apprehensive of tetanus. Fortunately, however, the wound soon suppurated, and in a few weeks was so filled up, as to enable the patient to leave the city, and retire among his friends to Annapolis, where by fresh air, and the kind and skilful attention of Dr. Ridgely, he was soon restored to perfect health. But the disease returned five or six years afterwards and destroyed him.

The structure of the tumour, when dissected, differed in some respects from that of common osteo-sarcoma. The rounded tubercles, which I have already described as occupying the surface, were also distributed throughout the substance of the tumour, and in fact composed its bulk. Where the superficies of these tubercles touched each other, irregular bony cavities were necessarily left; these were filled by a fatty matter. The tubercles themselves appeared to consist of bony spicula, incorporated with considerable quantities of a substance resembling cartilage. When forcibly separated from each other, torn portions or shreds of a very delicate membrane could be distinctly seen. This membrane served to cover each tubercle, and to connect it closely with the bony interstices. The whole tumour weighed five pounds and a quarter.

CASE IV.

——— Hilton, aged thirty-five, a cotton spinner, consulted me during the month of May, 1821, at the request of Dr. Physick, concerning a tumour situated upon the right cheek and upper jaw. At first sight, it appeared like the common fungus of the antrum maxillare; it was firmer to the touch, however, and less painful than that disease, as usually met with. The tumour could be felt by a finger introduced into the mouth, closely adhering to the gums, above all the teeth of the right side of the face, and extending upwards, so as to involve the cheek bone and part of the nose. According to the patient's account, the disease first appeared five months before, in the form of a small lump seated in the gum, above the canine tooth, and gradually increased without much pain, until it attained the size of her fist. Her teeth and gums had been previously sound, and as she was of vigorous constitution, and enjoyed excellent health, she was at a loss to account for the formation of the tumour.

It was evident that the disease would soon be beyond the reach of surgery, if not speedily arrested by an operation; to this she willingly consented, and on the third of June I performed it, in presence of several practitioners and students. The lining membrane of the cheek being necessarily connected with the tumour, and concealing its limits, was first extensively dissected. An attempt was then made to separate with a curved knife the tumour itself from the gums and alveolar processes; so completely, however, was it identified with the bone of the upper jaw, that only small portions could be detached at a time by the knife. Under these circumstances I determined immediately to knock away with the chisel and hammer, the whole alveolar processes and teeth connected with the diseased mass. With the cutting forceps I then cleared away, with great facility, the fragments of bone, and vacillating portions of the tumour, until I reached the antrum maxillare. This I found stuffed with a tumour of softer consistence than the one seated upon the face; but connected with it by a narrow neck. By means of curved knives, and a sort of raspatory, the whole antrum was soon cleared, and the operation finished. As may be supposed, the patient suffered exceedingly; but the operation was not for a moment interrupted by hemorrhage; indeed the flow of blood was so inconsiderable as to astonish every one present; no artery was taken up, nor was it necessary to use the sponge more than two or three times.* The wound healed completely in

* It has become fashionable among British surgeons to tie up the *carotid* and other large arteries, upon the most trivial occasions; with a view of diverting the current of blood during and after an operation. The ill success, however, which has hitherto attended the great majority of such exploits, may be considered a pretty fair comment upon the practice. The fact is, that the carotid may be tied with much greater facility than nine-tenths of the arteries of the body. Its exposed situation, and strong pulsations, would lead the merest tyro in surgery to its proper course. The extirpation of a common fungus or polypus of the antrum maxillare is by no means a difficult operation to the surgeon, however severe or formidable it may be to the patient; and we really think that the danger, if it be considerable, of removing such a tumour, does not consist in the simple operation itself, as it ought to be performed, but in the additional and unnecessary irritation communicated by the ligature of the carotid, which, of itself, and without any laceration of the face, would often be sufficient to produce death. The patients, if aware of their danger, might say to their surgeons, in the language of the frogs, "This may be very fine fun to you, gentlemen; but it is death to us."

four or five weeks, and the patient returned to her home in the country. The tumour, when examined after the operation, presented appearances corresponding so exactly with those already described, in the other cases, that it is unnecessary to detail them.

For some time there was no evidence of a return of the complaint; but as soon as her general health improved, and she became stout, the tumour of the face appeared, and gradually increased, until it became nearly as large as before the operation. Still anxious to get rid of her disease, and undismayed by the severe trials already encountered, she willingly consented to submit to any measure which might be proposed for her relief. In consultation, it was determined by Dr. Physick and myself, that another operation should be tried. This I performed on the 10th of September; but instead of pursuing the plan adopted on the former occasion, a transverse incision, three inches long, was made through the integuments and muscles of the cheek, so as to expose the limits of the tumour, which was then dissected, by curved knives, from the surface of the upper jaw. The next step of the operation was to remove the disease from the antrum maxillare itself. To accomplish this, a raspatory and small chisel, fixed on the handle of a knife, were chiefly employed. No hemorrhage took place during the operation, except from the division of the arteries of the cheek. The texture of the tumour was somewhat softer than it proved to be after the first operation, but was still composed chiefly of bone and cartilage, mixed with fleshy and steatomatous matter. The incision through the cheek was made with a view of facilitating both the removal of the tumour, and dressing of the cavity of the antrum; the latter was especially desirable, since an open wound, directly communicating with the cavity, would enable me to repress prolific granulations, and to remove any portions of disease as soon as generated. In spite of all my exertions, the disease reappeared in a few weeks, and the poor woman perished under the most horrible sufferings.

I have had occasion, at different times, to treat some other cases of osteo-sarcoma; but as the particulars do not differ essentially from those already stated, it would be superfluous to relate them. I may refer, however, to the case of osteo-sarcoma of the lower jaw, the outline of which is given under the head of exostosis.

Many isolated cases of osteo-sarcoma are scattered through the works of different writers. Sandifort* gives the history of a woman, forty-four years of age, who suffered for many years, and finally died, from a tumour composed of fungous cartilage and bone, which commenced in the palate, gradually filled the mouth, extended to the left cheek and temple, destroyed vision, and in the end involved nearly the whole skull, producing the most hideous deformity. Numerous physicians and surgeons were consulted in the commencement of the disease; but none were willing to operate.

In the Heaviside Museum† is contained a skull, from the right antrum of which projects an osteo-sarcomatous tumour of enormous size. The patient from whom it was taken, a woman thirty years of age, first perceived a small soft swelling, in the right nostril, about the size of the end of the finger. Under the impression that the disease was a polypus, her surgeons at different times, partially extracted it; but the operations only served to aggravate it, and at the end of five years it attained so large a size as to close the right eye, and force the teeth from their natural position, so as to make them stand at right angles with the alveolar circle. The whole tumour projected from the face four inches beyond the natural line of the bone, and was exceedingly vascular; so much so, that the patient was at last destroyed by spontaneous hemorrhage.‡

Under the title of "*fungous exostosis*," Sir A. Cooper§ has given the history of a tumour very analogous to osteo-sarcoma—if not the genuine disease. It was seated on the forehead, was very large, and had been growing several years. By the advice of Sir Astley, the patient submitted to an operation. The integuments being turned aside, and the tumour removed by a metacarpal saw, was found to consist of a substance softer than cartilage, mixed with numerous slender spicula of bone. On the fourth day after the operation, the patient became comatose, and on the sixth died. Upon dissection, both tables of the skull proved to be diseased, as well as the dura mater itself.

* Museum Anatomicum, vol. ii. p. 161, etiam vol. iii. tab. xxx. xxxi. xxxii. xxxiii.

† See Fox on the Teeth, vol. ii. plate 6.

‡ See Howship's Practical Observations in Surgery and Morbid Anatomy, p. 22.

§ Surgical Essays, part i. p. 214.

The inflammation, succeeding the operation, extended to the membranes of the brain, and produced death.

Vigarous* relates the case of a patient, from the middle of whose palatine arch he removed a large osteo-steatomatous tumour, the mouth was kept open by a wooden wedge, and the diseased mass removed by the bistoury and curved scissors. Speech and deglutition, which were very much interrupted by the disease, were soon restored, and the patient entirely recovered.

The lower jaw seems to be more subject to osteo-sarcoma, than any other bone: at least numerous cases of the disease thus situated, have been related. Scultetus† extirpated with success a monstrous tumour of the kind, which weighed fourteen ounces, grew from the base of the jaw, covered the greater part of the face, and extended down the neck. Bordenave‡ has recorded two cases of osteo-sarcoma of the lower jaw, one in a patient aged twenty, the other twelve years. The first originated from diseased teeth, and in four years acquired so considerable a bulk as to demand an operation. It was not extirpated, however, but perforated in two places, so as to give issue to a considerable collection of matter. The patient soon after died, and upon dissection, the greater part of the jaw was found converted into a lardaceous substance, mixed with bone. In the second case, the disease proceeded from a fracture of the chin; the tumour increased during twelve or fourteen years, and finally became so large, and produced so much irritation, as to terminate in death. Ribes§ has republished an interesting case, recorded by Lisfranc, of a large and malignant tumour (having all the characters of osteo-sarcoma) which occupied the chin, and was removed by Dupuytren, after several unsuccessful attempts by other surgeons. So extensive was the disease that it seemed necessary to cut through the jaw itself, on each side of the tumour, and insulate it. This was accordingly done, and the extremities of the bone were afterwards brought together and united, so as to constitute an artificial chin. The patient recovered in thirty days. The morbid mass weighed

* Œuvres de Chirurgie Pratique Civile et Militaire, de Barthélemi Vigarous, p. 538.

† Sculteti, Opera Chirurgica, tom. ii. p. 671.

‡ Mémoires de l'Académie Royale de Chirurgie, tom. xiv. p. 146.

§ Dictionnaire des Sciences Médicales, tom. xxiv. p. 430.

about a pound and a half. A woman about fifty years of age, had a large tumour on the inferior part of the right side of the face, for which she consulted M. Chaussier. The disease had advanced, however, too far to admit of remedy, and in a short time she died. Upon dissection it was found that the tumour was attached both to the lower jaw, and to its coronoid and condyloid processes, was filled with bony spicula, mixed with a fungous mass, and contained in several parts different fluids, some like the white of an egg, and others of thicker consistence, resembling lees of wine, and purulent matter.* The histories of three cases of osteo-sarcoma of the lower jaw, have been given by Sir A. Cooper.† The first occurred in a woman thirty-two years of age, and commenced in the form of a fungus, which sprouted from the alveolar cavities, and displaced the teeth. A tumour then formed, and continued to increase for eight years: it occupied the symphysis of the jaw, became very prominent, and burst through the skin. As the surrounding parts were apparently healthy, Sir Astley intended to extirpate the disease with part of the jaw. In the second case an enormous tumour occupied the chin, and measured from side to side five inches and a half, and in circumference sixteen inches. Finally, its magnitude became so considerable as to force the epiglottis upon the rima glottidis, and produce death. The patient was a female, and only twelve years of age when the disease commenced. The tumour was composed of cartilage and bony spicula, and upon the surface consisted principally of a white fibrous mass, resembling the elastic ligaments of the body. The third case was that of a female nineteen years of age. From the angle of the jaw to the symphysis, there was a large swelling, smooth and regular on the surface, and firm and elastic to the touch. It had been growing between three and four years, and proceeded from a decayed tooth, the fangs of which projected into the cartilage, which was effused within the bony cavity, and which, instead of producing suppuration and ulceration, kept up a degree of irritation that did not pass beyond the stage of adhesive inflammation, and a cartilaginous deposit took place in the first instance, to which succeeded an ossific effusion.”‡

* Dictionnaire des Sciences, &c., tom. xxix. p. 435.

† Surgical Essays, p. 186, &c.

‡ Surg. Essays, p. 192.

This tumour was removed by the knife, and the patient recovered in a short time.

Within the last few years, several operations have been performed in this country and in Europe, for the removal of osteo-sarcomatous and other tumours, situated on the upper or lower jaw. The practice may, perhaps, be said to have originated with *Dr. Deadrick* of Tennessee. This gentleman, in 1810, had a child brought to him fourteen years of age, with a tumour occupying the left side of the lower jaw. The tumour gradually increased, and finally attained such a size, as to require the removal of the bone upon which it was seated. "An incision was commenced," says *Dr. Deadrick*, "under the zygomatic process, and continued on the tumour, in the direction of the bone, to nearly an inch beyond the centre of the chin. A second incision was begun about midway, at right angles with the first, and extending a short distance down on the neck. The integuments were now separated from their connexion with the tumour, and the bone was sawed off immediately at the angle and centre of the chin. The wound was united in the usual manner, and the boy had a speedy and happy recovery.

Dupuytren, whilst on a visit many years ago to the Hospital of Invalids, remarked, that several of the soldiers had recovered after having large portions of the lower jaw swept away by bullets, grape-shot, &c. This circumstance induced him to attempt the removal of part of the jaw, in cases where tumours occupied its surface, or substance, in such a way as to render their extirpation impossible or unavailing. The first case upon which the experiment was tried, was that of a man whose lower jaw was occupied by an enormous tumour of many years' standing, and to get rid of which, several severe operations had been performed without effect, by other surgeons. *Dupuytren*, on the 30th of October, 1812, divided the jaw, at the symphysis, and cut away a large portion of the jaw, together with several of the molares teeth. In six weeks the patient recovered perfectly. The same surgeon has now performed the operation seventeen times, and in fifteen of the cases successfully. It is not stated, however, whether in the cases alluded to, the tumours were of the osteo-sarcomatous kind or not.

Dr. Mott of New York, in the year 1821, performed an extensive operation on the lower jaw of a young lady, for the re-

moval of an osteo-sarcomatous tumour which involved all the right side of the bone. The carotid artery was first tied, and on the following day, "feeling for the condyloid process, an incision was commenced upon it, opposite the lobe of the ear, carried downwards over the angle of the jaw, in a semicircular direction along the lower part of the tumour, as it rested upon the thyroid cartilage, and terminated about half an inch beyond the angle of the mouth on the chin. The termination of this incision upon the chin, was just above the attachment of the under lip to the bone, and the mouth was thereby laid open. I now extracted the second incisor tooth of that side, as it was in a sound part of the bone, and, after separating the soft parts from the side of the chin, and laying bare the bone, I introduced a narrow saw, about three inches long, similar to a key-hole saw, from within the mouth through the wound, and sawed through the jaw bone from above downwards. The lower part of the tumour was then laid bare, by cutting through the mylohyoid muscles, and the flap of the cheek carefully separated and turned up over the eye. This exposed fully to view the whole extent of the tumour as it run upwards to the *os malæ*. After the integuments were carefully dissected from the parotid gland, the masseter muscle was detached from its insertion until it came to the edge of the gland; then separating a thin plane of the fibres of this muscle, I now readily raised the parotid, without wounding it at this part. The maxilla inferior was now laid bare just below its division into two processes, and it appeared sound. To facilitate the sawing of the bones it was necessary to make a second incision about an inch long, down to the lobe of the ear and terminating at the edge of the mastoid muscle, then, with a fine saw made for the purpose, smaller and more convex than Hey's, I began to saw through the bone obliquely downwards and backwards, and finished with one less convex. The latter part of the sawing was done with great caution, to avoid excruciating pain from the laceration of the inferior maxillary nerve. When the bone was sawed through, the two processes were observed to be split asunder, and the coronoid to be drawn up by the action of the temporal muscle. An elevator was now introduced, where the bone was divided at the chin, by which the diseased portion was raised, when, with a scalpel passed into the mouth, the tumour was separated from the side of the tongue, as far back as the posterior fauces,

from the velum pendulum palati, and pterygoid processes. This loosened it very much, so that it could be turned upon the side of the neck. It was then separated from the parts below the base of the jaw, and also from the pharynx, and detached at the posterior angle, carefully avoiding the trunk of the natural carotid, and deep-seated jugular vein, both of which were exposed." Since the publication of this case, Dr. Mott has several times performed the operation for partial removal of the jaw, and in all cases, it is stated, except one, with success. Dr. Mott lays claim, also, I believe, to having been the first to remove the lower jaw at the articulation.

The following case of osteo-sarcoma of the lower jaw was communicated to me, in 1832, by Dr. William W. Anderson of South Carolina.

"About the middle of December, 1829, I was requested by Colonel S. to examine one of his negro men,—Tom, an African,—who was suffering great pain and inconvenience from a large tumour of the lower jaw, and to give my opinion whether or not it could be successfully removed by an operation. The plantation where the negro lived being sixteen miles from Stateburgh, it was not convenient for me to go so far until the last of the month, when I went to see him, and discovered his disease to be an osteo-sarcoma of the lower jaw of great size, and of twelve or thirteen years' standing. Tom was about forty-five years of age, in other respects healthy, and possessed a robust and strong constitution. When the disease first made its appearance, he was hired out on a neighbouring plantation, and his master did not know in what manner it commenced; but according to his own account it was occasioned by a severe blow which he received on his jaw. It continued small and grew very slowly for several years, after which it frequently broke and discharged an ill-conditioned and fetid humour, and increased rapidly. At this time the tumour extended from the next to the last molar tooth on the left side, to the angle on the other, involving nearly the whole of the lower jaw in the disease; but the great body of it lay on the right side and in front of the mouth. The chin, entirely deformed, projected ten inches beyond the neck, distending and protruding the under lip so far beyond its natural position, as to make it impossible for him to shut his mouth. The tongue was raised up and pushed from its place to the left side of the mouth, and confined in such a manner as to make de-

glutition difficult, and render his articulation so indistinct that he could hardly be understood. Externally the tumour presented a pretty even and uniform surface with the exception of some fistulous openings and the scars of others which had healed; but that portion of it which was to be seen within the mouth was very irregular, having deep indentations and fissures running in different directions, and openings which were constantly discharging their fetid matter mixed with saliva. All this portion of it was of a deep florid colour. Altogether the disease exhibited a loathsome and frightful appearance, and rendered the life of the poor negro almost insupportable. The extent and difficulty of the operation were explained to him; being at the same time encouraged by the probability of its successful termination, he readily consented to have it performed. He was accordingly sent to me in a few days, and on the 14th of January, 1830, in the presence of Dr. Richard Anderson, of Chesterville, Dr. Yeates, of this place, and several spectators, and particularly assisted by Dr. E. H. Anderson, of Camden, I removed the tumour in the following manner.

“Being seated in a chair and his beard shaven, the dimensions of the tumour were first taken. From the lobe of one ear to that of the other across the chin, it measured eighteen inches; from the lobe of the right ear to the termination of the disease on the other side, fifteen and a half inches; and from the trachea to the edge of the lower lip, ten and a half inches; and when removed, weighed within one ounce of three pounds.*

“The operation was commenced by making an incision from the side of the neck on the right side to the angle of the jaw on the left, passing under the chin in such a manner as to ensure a large flap, which was dissected down to the neck. Then another incision was made between the same points, following the direction of the jaw, passing some distance below the angles of the mouth, and leaving out all that portion of the skin which had become diseased—another flap was formed by dissecting the integuments from the upper side of the tumour. It is worthy of remark, that the chief difficulty occurred in performing this part of the operation, occasioned by a profuse hemorrhage which could not easily be stopped by ligatures; for besides the facial artery and some small branches which were easily secured,

* The preparation, presented to me by Dr. Anderson, is now in my cabinet.

some large blood-vessels lying immediately on the surface of the tumour, which seemed to be entirely venous, were divided, and bled so profusely that in a short time syncope was induced. It now became necessary to remove him from his seat, and place him in a horizontal posture, which occasioned a little delay; but the hemorrhage ceased, and the operation was continued by exposing the bone near to the tooth next to the last grinder on the left side, and dividing it as expeditiously as possible, with a metacarpal saw fixed for the purpose in the handle of a file. The soft parts were now divided, and the tumour removed by passing the scalpel through the diseased bone, on the right side, where it was very much enlarged, hollow and as soft as cartilage, leaving a portion of diseased bone at the angle of the jaw, which it was indispensable to remove to ensure the success of the operation. This was done with as little delay as possible, but was more tedious than the division on the opposite side, on account of its position and the bone being broader and less firmly fixed. There was no hemorrhage after the fainting, to retard the operation, nor did any occur after the circulation of the blood was fully restored. The blood being washed clean from the wound, and no further hemorrhage supervening after the patient had sufficiently revived, the flaps were brought together and united by the interrupted suture with strips of adhesive plaster between the stitches. A compress of soft rags, and bandage formed by a roller passing under the *chin* and over the head, and then round the head to secure it in its place, completed the dressings. He was very much exhausted by the operation, and when put to bed his pulse was extremely languid. He, however, breathed easily and made no complaint.

“15th. Rested well through the night, does not complain of much pain; pulse still languid, moves his tongue with facility, and articulates distinctly enough to be understood. *Evening.* Swallows with ease, and has taken in the course of the day a pint of arrow-root, made by pouring a pint of boiling water on a tablespoonful of the arrow-root, first mixed with a little cold water. It was sweetened and given to him through a small funnel.

“16th. Rested well last night, but complains more of pain this morning; has some headach, pulse fuller and more frequent, but no fever; has had no evacuation from the bowels since the operation; ordered a purgative enema. *Evening.* Enema produced two copious stools, which relieved his head; has taken

to-day a quart of arrow-root prepared with equal parts of milk and water, and sweetened with brown sugar.

"17th. Rested tolerably well; complains of headach, and feels very uncomfortable; suppuration copious, removed the bandages, washed the wound and dressed it, as at first, after which he took his arrow-root, and felt more comfortable. *Evening.* Has had a natural evacuation, pulse eighty-two, soft and regular.

"18th. Rested well last night, pulse eighty-six, and soft; takes nourishment well, bowels easy; wound suppurates freely, and a considerable space on the right side not united by the first intention; regret that I had not made use of the twisted instead of the common interrupted suture, as this last has not prevented the skin from folding inwards and separating the cut edges.

"19th. Doing well, cavity of wound filling up with healthy granulations, appetite good, evacuations regular, rests well.

"21st. Removed the common sutures from that portion of the integuments on the right side, which did not unite by the first intention, and made two quilled sutures.

"25th. Continues free from fever, rests well, has good appetite, takes nourishment freely, articulates better, and improves daily in his appearance. The quilled sutures have answered completely the intention of keeping the edges of the integuments in apposition. The tongue, which has been furred since the operation, is now quite clean.

"From this time every thing went on well, the healing process, though slow, was not interrupted by any untoward circumstance. He grew tired of liquid food, and about the middle of February began to eat rice and milk, hominy and milk, and sometimes molasses instead of milk. On the first of March, he was able to go about, and assisted of his own accord some carpenters who were at work near his house in handling their tools, holding timbers which they were hewing, and the like. There was still a small opening through the cheek through which particles of food passed whenever he eat. I neglected him somewhat, and it remained so for some time. It became necessary to touch it with caustic, and to apply a strip of adhesive plaster, which had the desired effect, and in a short time it was entirely healed, except a hole about the size of a small quill, which was again neglected, and remained so until about the first of May,

saliva, and small particles of food passing through it, when the caustic was again applied, both externally and inside of the cheek, with the same good effect. It now healed up entirely, and has remained well to the present time, just two years having elapsed. Tom expressed such a strong desire to live with me, that I purchased him, and he has been a constant labourer on my plantation ever since. I hear of no difficulty about his eating, and he has not during that time, to my knowledge, been stopped from his work by any sickness, except a slight attack of bilious fever last autumn, and a small hurt which he received by a fall from a wagon. The disease appears to be entirely eradicated, and the flesh is as firm and sound there as in any part of his body. The flaps were very large, and in healing formed a fold in front of the scar left by the wound in such a manner as to supply in some measure the place of a chin, and he is by no means as much disfigured as one might suppose a person would be who had lost almost the whole of his lower jaw bone. The deformity is not so great as to attract particular notice, or to render his appearance disagreeable."

A very interesting case of excision of part of the lower jaw, occurred in the practice of Professor Lallemand of Montpellier, in the year 1823. The patient was in great danger of suffocation from asphyxia, and also from loss of blood. Under these trying circumstances, the operator first determined to arrest the hemorrhage, in which he succeeded, and then opened with a bistoury the membranous space between the thyroid and cricoid cartilages, immediately after which the patient breathed freely, opened his eyes, raised himself upon his seat, and recovered entirely in the course of a short time. By my son, Dr. Charles Bell Gibson, Professor of Anatomy in Washington College, Baltimore, amputation of the lower jaw was successfully performed six years ago. The following account, published by him in the *American Journal of the Medical Sciences*, will be read with interest. "Moses Lee, blacksmith, fifty-one years of age, of robust make and active habits, a slave belonging to the estate of the late Richard O. Grayson of Loudon county, Virginia, was placed in my hands in April, 1842, for the treatment of a tumour involving a large portion of the os maxillare inferius. About six years since, whilst engaged in ploughing, some obstacle occurring in the course of his furrow, caused the handle of his

plough to be thrown suddenly upwards, striking him severely in the centre of his chin, and producing very severe pain in the part for a few days. In less than a week afterwards he discovered a slight swelling immediately over the spot, but as the pain had ceased, he paid little attention to it, unless when startled by a spontaneous jet of blood which occasionally occurred from between the first incisors of each side. The tumour increased slowly, at the end of a year having attained the size of a hickory-nut. From that period until I saw it, it increased more rapidly, but without pain; the only inconvenience being the difficulty of articulation and deglutition. The tumour was confined to the lower jaw, having sprung apparently from the spot where the blow was received, directly in the middle of the chin, and extending itself with great regularity towards the angles of the bone. The limit of the disease was evidently just in front of the first molar tooth on each side, the measurement from one point to the other being exactly fourteen inches.

In an upward direction it extended nearly to the roof of the mouth, having pushed from their sockets all the incisors, the cuspid and one of the bicuspid on both sides of the upper jaw, and separating the lips vertically to the extent of four and a half inches. Within the mouth and below, it extended along the under surface of the tongue to the anterior border of the sublingual gland, just in front of which, the uniformity of the surface was broken by a rising, or lobe, of the size of a black walnut, on which rested part of the under surface of the tongue. Over the whole surface of the tumour, which was intensely red, large veins were freely distributed, and at points in front were two deep ulcerations, from which, as well as from numerous small openings, was discharged a yellowish sero-purulent matter, small in quantity and possessing but little odour. To the touch the general impression was hard, though in some places an elastic, and in others a decidedly fluctuating sensation was evident, especially in front, and where the tumour protruded between the lips. I performed the operation on the 12th of April, in the presence of a number of the medical men of this city. I am particularly indebted to Dr. Baxly, T. Buckler, and Theobald for their valuable aid on this occasion.

The patient was seated in an ordinary chair, his head supported by an assistant, standing in front. I made the first incision three-fourths of an inch to the left of the median line through

the thickness of the lower lips, in a straight line down as far as the diseased mass could be felt, an extent of about seven inches. The second incision was precisely similar, at the same distance from the median line on the right side; thus leaving attached to the tumour an inch and a half in width, of lips and integuments, which it was thought would be superfluous in the union to be effected after the removal of the tumour.

A dissection was now rapidly made from the point of the first incision to the second molar tooth; the first molar on this side was soon extracted by the dentist's key in order to remove with more facility the bone, just anterior to the second molar, and thus ensure, as far as possible, the removal of all the diseased portion. The same course was followed on the right side. I now took a position directly behind the patient, his head resting on my breast, and the flaps on the left side being held out of the way, sawed from above downwards through the bone on that side, cutting through the cavity occupied by the root of the extracted molar. In the same way the right side of the bone was sawn through. Coming again in front and grasping the mass with the left hand, it was easily brought away by dividing its connexions with the digastric mylo-hyoid and genio-hyoglossus muscles. The hemorrhage from the cavity thus exposed was profuse. The submental and inferior coronary branches of the facial artery of both sides were easily secured, but the ranine and sublingual arteries gave us very considerable trouble, retiring out of sight, and from increasing weakness of the patient giving a scarcely perceptible jet, we removed him into the open air, in a yard adjoining a room, and this, with the aid of some wine and water, in about twenty minutes caused his pulse to rise and the bleeding muscles were secured. From the division of the genio-hyo-glossus muscle, considerable inconvenience was produced in the disposition in the tongue to turn over and point down the pharynx.

A ligature passed through the frænum and secured after the dressing of the wound was completed, to an iron wire contrivance, removed the inconvenience. The apparatus consisted of an upright on either side of the head, having a horizontal position on a line with the mouth, and projecting some three inches beyond it. A single piece of iron wire was procured for the purpose. Having carefully examined and determined the complete extirpation of the diseased bone, the edges of the wound were brought together and retained by hair-lip pins and the interrupted suture.

Straps and cotton completed the dressing, and the patient was put to bed. The oozing of blood continuing considerable, a piece of fine sponge was steeped in the muriated tincture of iron and introduced into the mouth. The discharge was then entirely arrested. In about a fortnight the wound was healed up and the patient recovered almost without deformity." There was no return of the disease, but the patient died of pleuritis during the winter of 1844.

By the same surgeon a similar operation was performed on the 12th of June last, on a negro woman, from Anne Arundel county, Maryland, for an enormous osteo-sarcomatous tumour of two years' growth. The primitive carotid in this case was tied previous to amputation of the jaw. Several other cases of partial amputation of the lower jaw have been published, particularly by Lizars, Bachelder, Wagner, Cusack, Syme, Crampton, Rogers, Randolph, &c., the particulars of which it is unnecessary to detail in a work of this description.

Although small portions of the clavicle had been removed by Davy and others, yet it remained for our countryman, Dr. Mott, to demonstrate the possibility of extirpating, successfully, the whole of that bone, in a case of osteo-sarcoma. "The tumour," says Professor Cooper, "was of the size of two fists, and reached upwards nearly to the hyoid bone and angle of the jaw. A semi-lunar incision, with its convexity downwards, was made below the swelling, from one end of the bone to the other. Another incision was next made above the tumour from the acromion to the external margin of the internal jugular vein. The platysma and a portion of the trapezius having been divided, a director was passed under the bone, near the acromion, and a division here effected with a chain saw; not being yet able, however, to displace the tumour, Dr. Mott, with the aid of a director, extended the first incision inwards; and having applied two ligatures to the external jugular vein, and cut it through in the interspace, he next divided the clavicular portion of the sternomastoid muscle, and found it necessary, also, to tie and divide the internal jugular vein. The subclavian vein and thoracic duct were separated from the diseased parts with the handle of the scalpel. Lastly, the great pectoral muscle, the costo-clavicular ligament, and the subclavian muscle having been divided, the disarticulation of the sternal end of the clavicle was accomplished. The bleeding required forty ligatures for its suppres-

sion. In six weeks the wound was nearly healed, and the patient afterwards, with the aid of a mechanical substitute for the clavicle, retained the power of moving the limb with but little impairment."

Extirpation of the whole scapula, for various tumours and injuries, has, in several instances, been executed. The same may be said of excision of one or more ribs, the radius, fibula, and other bones.

From the success which it appears attended some of the operations referred to, it may, perhaps, be inferred that the position I have laid down in relation to osteo-sarcoma,—that it is probably of a cancerous nature, and that operations often fail in removing it,—is erroneous.* It will be recollected, however, that many of the operations performed on the jaw were for diseases very different from osteo-sarcoma; and I think, too, from close observation of the details of some of the cases considered by the operators as osteo-sarcomatous, that such in reality was not the nature of the disease.

Osteo-sarcomatous tumours, of enormous size, have been found occasionally upon the shoulder. An interesting case of the kind has been related by Mr. John Bell. The patient,† a tall, athletic young man, received a contusion upon the arm and shoulder whilst engaged in violent exercise. Inflammation and swelling supervened, but soon subsided, and the patient imagined himself well. At the end of a month from the accident, the pain returned, the arm and shoulder gradually enlarged, and the limb became so weak that he could not raise it to his head; still he could lift perpendicularly a very heavy weight. As the tumour increased, which it did rapidly, the pain became so intolerable, that "his cries could be heard miles off." At the end of nine months, the whole swelling greatly exceeded in size the patient's body. "When I went to receive this poor lad," says Mr. Bell, "I found him lying deep in the hold of a small sloop, in which he had been transported from Inverness, laid on a coarse mattress, and bolstered up against the shelving side of the vessel; and when the clothes were lifted, I solemnly declare that I hardly knew at first what it was that I saw; which

* From recent statements it appears that very few of the cases referred to above eventually proved successful.

† Principles of Surgery, vol. iii. p. 82.

was the tumour, and which his body, or how to connect in imagination the one with the other. He lay in an inclined and irregular posture, extremely languid, and hardly able to articulate; his head inclining to one side, the tumour, when first exposed by lifting the clothes, might be mistaken for his body; in respect of size, it was of a suitable bulk, and when the lean, yellow, and emaciated thorax was next exposed, the tumour seemed so much to exceed it in size, with a shining surface and brilliant colour, that, at first, I was more confounded than shocked, so impossible was it, in the first moments, to consider of it as a tumour, or to see its relation to the arm. The forearm was dwindled and shrunk, and projected from the tumour at a strange and unnatural distance from the shoulder; the veins were swelled like those of a horse's belly; large fungous tumours, as big as oranges, projected in a group from the outside of the arm, at the place where, about two months before, a large abscess had burst; and such was the fœtor of the matter running from under these fungi, and the languor of this poor, emaciated creature, that I had no thought for the present but how to get him conveyed alive to town."

Mr. Bell proposed in this case to secure the subclavian artery by ligature, to saw through the outer end of the clavicle, and then turn off the scapula, and separate both it and the whole arm from the body; the patient, however, was sunk too low to sustain so formidable an operation, and died soon after from hemorrhage. Upon the dissection, the diseased mass consisted of a substance like callus, mixed with a large proportion of solid bone, and every where contained cells, which were filled with a matter resembling thick cheese. The shoulder bone was spongy and ulcerated, and could be traced through the whole tumour; indeed, all the bones forming the shoulder joint were extensively involved in the disease. A case in some respects similar to the one just related, is recorded by Boyer.* The patient, a priest, aged forty-seven, fell while running in the street, and received a severe contusion on the right shoulder. Some time after a swelling, about the size of an egg, appeared near the injured part, and gradually increased, until the whole shoulder, armpit, and greater part of the arm, became involved. The pain was intolerable, but its violence could sometimes be assuaged by opium

* Boyer on the Diseases of the Bones, vol. i. p. 363.

and emollient applications. No permanent relief, however, was procured, and the patient died in a few months after the accident. In circumference, the tumour measured *thirty-six* inches, and in diameter, *sixteen*. Its weight, with that of the arm, was thirty-three pounds. The opposite arm weighed six pounds, so that the tumour itself must have equalled twenty-seven pounds. When dissected, the appearances usually present in osteo-sarcoma were discovered.

The most interesting case of osteo-sarcoma I have ever met with, occurred in New York several years since. The patient, Mr. Hart, was a small, thin, and delicate man, who had received an injury on the inner side of the right thigh and pelvis, some years before. From that period a tumour arose from the ischium and ramus of the pubes, which extended downwards, and gradually involved the greater part of the thigh. The patient had consulted numerous surgeons in relation to it, most of whom advised its removal; his own consent to the operation, however, could not be obtained, until the dimensions of the tumour became so enormous as to interfere materially with progression, and affect his general health. He then consulted Dr. John Kearney Rodgers, one of the most eminent of the New York surgeons, at whose request I visited the patient in October, 1838. After close examination, taking a cast in plaster of all the parts involved, and minute inquiries in relation to the patient's constitution and health, we determined, unfavourable as the case was, from the immense size of the tumour, the natural delicacy of the man, and the delay occasioned by his indecision, to advise the operation, as the only means of saving his life—taking care to explain fully to the patient and his friends, the uncertainty of the result. There being no question as to the nature of the disease, and having reason from the emaciation and debility of the patient, to dread the shock that might be communicated to the nervous system from a protracted operation, it had been resolved between Dr. Rodgers and myself, that the tumour should be removed as quickly as possible, and that the only way to effect this would be to plunge intrepidly into the heart of it, by making a perpendicular cut with the amputating saw—its back being previously removed—through the bony mass to the very base, and then turning off quickly by pressure, and by a strong scalpel with a thick edge, one half of the tumour, to remove the rest by the horizontal application of the

saw—in order to avoid the tedious and painful operation of dissecting back the integuments and muscles from the surface of the tumour, and of taking up blood-vessels. By the advice of Dr. Stevens, however, who attended at the operation, and assisted Dr. Rodgers in it, this plan was deviated from after the incision through the skin was commenced. The operation, therefore, although admirably performed, and with the utmost coolness and intrepidity, was necessarily a protracted and very painful one; so much so that the patient was obliged to be sustained in the midst of it by brandy, ammonia, and other stimulants, and at one time appeared nearly pulseless. He rallied, however, and in a few hours the circulation was so far restored as to afford hope of recovery. But this was delusive, and he sunk in twenty-two hours—purely from irritation, or the shock extended to the nervous system.

Upon examination of the tumour, all the characters of genuine osteo-sarcoma were displayed, and every evidence afforded of the tumour having commenced at the ramus of the pubes and ischium, where the injury was first sustained. The morbid mass, to the best of my recollection, weighed between twelve and fifteen pounds. The particulars of the case as drawn up by the intelligent operator, may be found in the first volume of the New York Medical and Surgical Journal for 1839. A very fine cast of the parts, previous to operation, adorns my cabinet.

Many other examples of osteo-sarcoma, occupying different situations, might be adduced; it may be sufficient, however, merely to refer to a few cases. Leeson* has given an account of a large semi-osseous tumour, seated on the ribs of the right side, and resembling in some respects the case of Mr. Carroll's man. Three cases of osteo-sarcoma of the radius, knee, and leg, have been furnished by Cooper.† Boyer,‡ Houstet,§ and Daubenton|| have each described very large osteo-sarcomatous tumours of the thigh; Petit,¶ Bonté,** and Vigorous†† have furnished similar cases of the leg.

* Medical and Physical Journal, vol. x. p. 162, and vol. xii. p. 465.

† Surg. Essays, pp. 184, 185, and 195.

‡ Boyer's Treatise on Surgical Diseases, vol. ii. p. 174.

§ Mémoires de l'Académie, tom. viii. p. 9.

|| Cabinet du Roi.

¶ Traité des Maladies des Os. tom. ii. p. 198.

** Journal de Médecine, tom. xii.

†† Œuvres Chirurgicales, p. 548.

Consult J. Bell's *Principles of Surgery*, vol. iii.; Boyer's *Treatise on Surgical Diseases*, vol. ii. p. 172; Cooper and Travers' *Surgical Essays*, part i. p. 169; On Excision of the Jaw, see a Case of Removal of a portion of the Lower Maxillary Bone, by W. H. Deadrick, M. D., of Rogersville, Tennessee, in *American Medical Recorder*, vol. vi. p. 516; On the subject of Dupuytren's first Case, Consult *Dictionnaire des Sciences Medicales*, tom. xxix. p. 430; Mott's Case of Osteo-Sarcoma, in which the right side of the Lower Jaw was removed successfully, after tying the Carotid Artery, in *New York Medical and Physical Journal*, vol. i. p. 386; Mott's second Case, in which the left Carotid Artery was tied, and a portion of the Lower Jaw Bone removed successfully, *ibid.* vol. ii. p. 157; Mott's Case of Osteo-Sarcoma, in which the Lower Jaw was removed at the Articulation on one side, after tying the Carotid Artery, *ibid.* vol. ii. p. 401; Lallemand's Case of Amputation of the Lower Jaw, in *Johnson's Medico-Chirurgical Review*, vol. v. p. 213; Lizar's Case of Excision of the Lower Jaw, in *Edinburgh Medical and Surgical Journal*; Bachelder, in *Boston Medical Intelligencer*; Wagner in *New York Medical and Physical Journal*; Cumin in *Edinb. Med. and Surg. Journ.* 1825; H. Mayo, *Outlines of Human Pathology*; Crampton in *Dub. Hospit. Rep.* vol. iv.; Malgaigne, *Man. de Med. Oper.*; Velpeau *Mem. Elem. de Med. Operat.*; Liston's *Elements of Surgery*.

SECTION VIII.

MOLLITIES OSSIUM.

THERE is a manifest distinction between mollities ossium, or softening of the bones, and rachitis. In the one, the bony tissue loses its natural firmness—in the other, the earthy matter is originally deficient. Hence rickets is peculiar to infancy, and mollities ossium confined almost exclusively to adults. Women are said to be more subject to the disease than men, and middle-aged persons than youth. Bones affected with mollities ossium are not, however, merely deprived of phosphate of lime. Both the animal and saline parts appear to diminish until mere shells are left, which are so soft as to be easily cut with a knife. These shells have large cavities, communicating with each other, and containing coagulated blood or an oily matter. In some cases all the bones of the body are simultaneously affected.

The symptoms are often very insidious in their approach, and sometimes manifest themselves after an injury. General weakness, severe pains in the extremities, loins, and back, with spasmodic twitchings, profuse and constant perspiration, and heat of the skin, difficulty of breathing, spitting of blood, high fever and chalky sediments in the urine are the most common attendants. After a few months the bones become very flexible, and being no longer able to support the body, the patient is bed-ridden, the whole figure horribly deformed, and death follows either from convulsions, or from long-continued suffering or exhaustion. Fortunately, however, the disease is extremely rare.

TREATMENT OF MOLLITIES OSSIIUM.

This disease is seldom cured, and never, perhaps, unless very limited in extent. In general, little more can be done than support the patient's strength by tonics and nutritious diet. By some, the internal use of phosphate of lime has been extolled, by others condemned, as at least useless. "If we examine," says Boyer, "the treatment that has been proposed for this disease, we find it consists in the employment of various means for the cure of those diseases with which it may be combined. Preparations of mercury, antimony, iron, alkalies, sulphur, have equally succeeded in cases to which they were suited. Tonics are generally serviceable; but we think that many cases have spontaneously come to a happy termination during the use of inefficient remedies. It is proper to advise a change of air, a transition to high, warm, and dry situations, the use of nourishing animal food and generous wine, dry frictions, with aromatic substances over the body, and tonics of every kind."

Consult Wilson's Lectures on the Bones, p. 252; Gooch's Works, vol. ii. p. 393; Bromfield's Chirurgical Observations, vol. ii. p. 50; Allan's Surgery, vol. ii. p. 44; Bostock, in Medico-Chirurgical Transactions, vol. iv.; Boyer's Surgery, by Stevens; Mayo's Human Pathology.

SECTION IX.

FRAGILITAS OSSIIUM.

EXTREME brittleness of the bones from old age, syphilis, scurvy, and other constitutional diseases, is sometimes met with. Bones thus affected, however, do not upon examination always present appearances we should be led to expect; for instead of the usual proportion of earthy and a deficiency of gelatinous matter, upon which fragility is commonly supposed to depend, they appear to be completely saturated with oil, and can never afterwards be entirely divested of it.

In a preceding part of this volume,* I have furnished numerous examples of fragilitas ossium from constitutional and local causes, followed by fractures. A more striking instance of that peculiarity than any I have mentioned, is referred to by Professor Cooper. "Dr. Good was once present," says he, "at church, in which a lady, nearly seventy-two years old, broke both the thigh bones by merely kneeling down; and on being taken hold of to be carried away, had an os humeri also broken, without any violence, and with little pain. Hardly any constitutional disturbance ensued, and in a few weeks the bones united."

TREATMENT OF FRAGILITAS OSSIIUM.

Fragilitas, like mollities ossium, may generally be considered incurable. Some advantage, however, is occasionally derived from internal medicine when the disease proceeds from syphilis, scurvy, &c.

See Gooch's Works, Boyer's Treatise on Surgical Diseases, vol. ii. p. 180; Wilson's Lectures on the Bones, p. 258; Cooper's Dictionary of Surgery, p. 504, 4th edit. London, 1822; Mayo's Human Pathology; Salter, in Med. Chir. Transact. vol. xv.; Cooper's Dictionary of Surgery, 7th edit.

* See page 234.

SECTION X.

RACHITIS.

RICKETS was formerly a very common disease in Europe, and is said to have prevailed to a great extent in England, during the seventeenth century. It is now, however, comparatively rare, and in this country almost unknown. Children between the age of six months and two years, are most subject to it. The symptoms are disorder of the digestive organs, swelling of the abdomen, emaciation of the limbs, dryness and discoloration of the skin, blackness of the teeth, &c. These are soon followed by distortion of the limbs, spine, and ribs, which sink under the weight of the body, and bend from muscular action. In the end, every bone will be found more or less affected, and in bad cases the patient is sure to be horribly deformed. The pelvis, in particular, is extremely apt to suffer. The pubes fall backwards towards the sacrum, and the ossa innominata incline inwards, and encroach upon the cavity of the pelvis. All the long bones become convex. The spine is short and projects posteriorly, while the sternum is rendered unusually prominent. According to Cumin and most other writers, the ends of rickety bones are expanded and protuberant. This, however, has been denied by Mr. Stanley. The same gentleman also remarks, that most rickety bones resemble cartilage in texture and are filled with cells containing a brownish gelatinous substance.

A deficiency of phosphate of lime, arising, in all probability, from want of power in the arteries to secrete a sufficient quantity of this earthy material, is the immediate cause of rickets. The disease is apparently often connected with scrofula; generally, however, it occurs at that period of life at which the marks of scrofulous diathesis are scarcely manifest.

TREATMENT OF RACHITIS.

The chief indications in the treatment of this disease, are to strengthen the system by tonic medicines, and to keep the stomach and bowels free from acidity by gentle purgatives fre-

quently repeated, and to place the patient upon a nutritious diet, consisting wholly of animal food. Together with these constitutional means, local remedies may prove highly serviceable—especially frictions with stimulating oils, and frequent ablution with salt water. After the patient has attained a sufficient age, and acquired the requisite strength, the apparatus formerly commended in the treatment of curvature of the spine, may be sometimes employed with advantage, but great care must be taken not to exert undue pressure upon the hips, chest, or limbs. The late Mr. Wilson condemned machinery of every description in this disease, and relied very much in cases of lateral curvature of the spine, a very common consequence of rickets, upon pressure on the head by means of a weight equal from four to ten pounds, “on the principle of producing frequent and equal action of the vertebral muscles.” This plan I have practised in numerous cases of spinal deformity, and always with more or less advantage.

See Wilson's Lectures on the Diseases of the Bones, &c. p. 159; Stanley, in *Medico-Chirurgical Transactions*, vol. vii. p. 404; Richerand's *Nosographie Chirurgicale*, tom. iii. p. 142; Delpech's *Précis Elementaire des Maladies Chirurgicales*, tom. iii. p. 739, Paris, 1816; Allan's *System of Pathological and Operative Surgery*, vol. ii. p. 38; Alexander Shaw, in *Med. Chirurg. Transact.* vol. xvii.; Cumin, in *Cyclop. of Pract. Med.*; Jul. Cloquet, *Patholog. Chirurg.* Paris, 1831; Mayo's *Outlines of Human Pathology*, Lond. 1835; Brayne, in *Transact. of Provincial Med. and Surg. Association*, vol. iii.

SECTION XI.

SYNOVIAL INFLAMMATION.

THE synovial is a thin, delicate, and vascular membrane, which lines the ligaments of joints, covers partially the bones and cartilages, and, like the peritoneum, is a complete bag without an opening. Naturally it is not very sensible; but when it once takes on inflammation, the pain and other symptoms may

be very severe. Under the title of inflammation of the synovial membrane, a peculiar disease has been comprehended, which was formerly confounded with other affections of the joints, and, indeed, under the common appellation of white swelling. To Sir Benjamin Brodie the profession is under great obligations, for the scientific and satisfactory distinctions he has drawn between these different and very opposite affections, and for the successful modes of treatment he has, in many instances, substituted. This arrangement, now generally adopted, I shall adhere to.

Synovial inflammation, in many European countries, Britain especially, is a very common complaint. In America it is sometimes met with, and is generally the result of cold, or of some constitutional affection. Occasionally it is the effect of local injury. Adults are much more liable to the disease than children; the latter, indeed, when very young, are hardly subject to it, and this will serve, in many instances, to distinguish the disease from other affections. Although all the joints are more or less exposed to attacks of this inflammation, the knee is the most frequent seat of it. In the commencement, the pain is not commonly severe, and the inflammation has rather a chronic than active character. A general swelling is soon perceptible about the articulation, the form of which varies according to the particular joint that may happen to be attacked. The swelling at first is the result of a collection of fluid within the cavity of the joint; but in a short time this fluid is partially or totally removed, and its place occupied by masses of coagulable lymph, which are poured out by the vessels, and adhere to its internal as well as external surface. In this state the disease may continue for weeks or months, and then subside spontaneously, or by the use of appropriate remedies. It is very liable, however, to return; and should the patient be so unfortunate as to have frequent attacks of it, there will not only be great risk of ankylosis, but every prospect, eventually, of suppuration within the joint, and of ulceration and destruction of the articular cartilages. Delicate females are much more liable to attacks of synovial inflammation than males; and the disease is more apt to occur in winter and spring than at any other season. Sometimes the attack comes on very suddenly, especially among those who have had repeated returns of the disease, from imprudence in exercise or exposure to cold; and I have known repeated instances of

persons being seized in the street and unable to walk home. Often the affection is dependent upon gout, rheumatism or syphilis; and occasionally is the result of the abuse of mercury. In all of these cases several joints are commonly involved at the same time. "Where the inflammation," says Sir Benjamin Brodie, "is connected with gout, the pain is generally out of all proportion to the other symptoms of inflammation; and the patient compares his sensations to those, which might be supposed to arise if the joint were compressed by a vice, or if it were violently torn open." Upon the whole there is not a more insidious, deceptive disease than synovial inflammation, especially when the knee joint is the seat of it; and above all when the surgeon, mistaking the nature of the complaint, permits the patient to take undue exercise, or applies inappropriate remedies.

TREATMENT OF SYNOVIAL INFLAMMATION.

The remedies for synovial inflammation are general and local. In the early or acute form of the disease, blood-letting, purgatives, saline draughts, and diaphoretics will prove eminently useful. After full benefit has been derived from these, leeches in the vicinity of the inflamed joint, followed up by cold saturnine lotions, or if the pain and swelling be very great, by warm poultices or fomentations, will also afford considerable relief. From the first the patient must be confined to a mattress, and one or both limbs elevated upon a single inclined plane. By pursuing these measures vigorously, in the incipient form of the disease, a perfect cure may often be effected in a very short time. If, however, the patient has not applied early, but has continued to walk about, and the disease has assumed the chronic form, other remedies, in addition to the continuance of those mentioned, will be required; and of these blisters, after the inflammation has been subdued, will be found the most useful. They should be of large size, and frequently renewed. Dr. Physick, however, seldom employed blisters, under an impression that the irritation they occasioned, increased the disease. But he is not sustained in this position by other surgeons. Brodie, in particular, deems them indispensable, and more useful in subduing the swelling than any other remedies. The same experienced

surgeon also recommends evacuating by puncture the fluid contained in the knee joint, provided the distention is very great. "In a thin person," says he, "if a few punctures be made with an instrument a very little broader than a couching needle, by means of an exhausted cupping-glass applied over the punctures, a large quantity of fluid may be easily abstracted without the smallest danger, and with no inconsiderable relief to the patient. But while inflammation exists the relief is not permanent, the fluid being rapidly regenerated; so that in a day or two, or perhaps in a few hours, the swelling is as large as ever. If, on the other hand, the inflammation be already subdued, the absorption of the fluid usually goes on so rapidly that any more expeditious method of removing it is unnecessary. If suppuration," he continues, "has taken place in the joint—not in consequence of ulceration, but from the surface of the synovial membrane—a free opening made into it with a lancet will often be attended with the best effects." This practice, however, it is proper to state, is decidedly adverse to that of most other surgeons, but it emanates from authority it is impossible to overlook, and therefore should receive a fair trial.

The inflammation having been nearly subdued, it may become necessary to employ other remedies. These are liniments, stimulating plasters, issues, setons, moxa, pressure from bandages, adhesive straps, champooing, vapour-baths, gentle exercise, &c. Great care must be taken, however, not to excite by these means *too much* irritation, lest the inflammation, as has often happened, be renewed. When synovial inflammation depends upon rheumatism, colchicum, mercury, opium, and ipecacuanha must be employed. In gouty cases, also, colchicum will prove eminently useful. The same may be said of mercury, in cases of syphilitic synovial inflammation, and particularly of calomel combined with opium, and afterwards sarsaparilla. If, as too often happens, the patient falls into bad hands, grows tired of long confinement and restraint, is determined to use exercise, and, under such mistaken views, leaves his mattress, and indulges his appetite, although he may be benefited, apparently, for a short time, yet the symptoms, in the end, are sure to be aggravated, ulceration of the cartilages takes place, and amputation or death is the almost certain consequence.

SECTION XII.

SYNOVIAL DEGENERATION.

By this term I have ventured to designate that form of disease so accurately described by Sir Benjamin Brodie, under the rather complicated title of "*morbid change of structure in the synovial membrane*,"—a disease, according to his account, belonging to the same order as tubercles of the lungs, scirrhus of the breast, and fungus hæmatodes of the testicle. It is an affection scarcely ever met with except in patients under or not much above the age of puberty. In almost every instance the knee joint is the seat of the complaint. Sir Benjamin Brodie never met with an instance of it in the hip or shoulder, but Mr. Hodgson furnished him with two examples of it—one in the ankle, the other in the finger. At first the pain is very inconsiderable, or rather there is a sense of uneasiness accompanied by slight swelling and stiffness. In a few weeks the swelling increases irregularly, and always imparts a deceptive sensation of fluctuation. After a time the motion of the joint is nearly destroyed. The patient, however, until abscesses form, does not commonly experience much pain. If suffered to proceed, one or two years will often elapse before the disease terminates. In such cases, the patient dies worn out by hectic. Upon dissection, the synovial membrane will be found converted into a pulpy substance, of a reddish or light brown colour, mixed with whitish lines, varying from a quarter of an inch to an inch in thickness. The cartilages, ligaments, and bones of the joint, moreover, are partially or wholly destroyed, and bathed in matter.

In the greater number of cases, the disease may be distinguished, it appears to Sir Benjamin Brodie, from other affections of the joints, by "the gradual progress of the enlargement, the stiffness of the joint without pain, and the soft elastic swelling, devoid of fluctuation," provided both hands be employed in the examination, without which, the most experienced surgeon would be apt to declare that there was fluid in the joint.

TREATMENT OF SYNOVIAL DEGENERATION.

Unfortunately, with one exception, the remedies for this disease are palliative, merely. By low diet, topical or general blood-letting, rest, fomentations, poultices, and a mild climate, the progress of the complaint may be retarded, and the pain relieved; but eventually, amputation must be resorted to, and this, if delayed too long, will prove fruitless. Indeed, if the observation of Sir Benjamin Brodie be correct, there is no probability that a cure will be permanently effected in this complaint, even if amputation should be performed in the very commencement of it; for, says he, "Physicians and surgeons have been employed during successive ages, in endeavouring to discover a cure for tubercles of the lungs and cancer of the breast, and the result of their labour is only to prove that these diseases are incurable. Analogy, therefore, would not lead us to be sanguine as to the discovery of a remedy for this affection of the synovial membrane, and experience demonstrates that it is equally incurable with other maladies of the same order."

SECTION XIII.

WHITE SWELLING.

UNDER this title almost every disease of the knee joint was formerly comprehended; and although much of the obscurity in which such complaints were involved has been cleared away by the researches of modern pathologists and practical writers, yet it is not perfectly decided to what complaint the term should be restricted. So far as I am able to determine this point I am inclined to say that the two affections—ulceration of the articular cartilages, and scrofulous enlargement of the joints—taken conjointly, will include as much as the older surgeons, at least,

intended to convey by the whimsical appellation above mentioned. Of these diseases, as they occupy the hip, I have already given an account, but shall here state a few peculiarities when the knee is the seat of them. The pain and swelling in the commencement are not considerable; but after the lapse of weeks or months, both are augmented. The pain, especially, becomes after that period very severe, and is seated, chiefly, on the inside of the head of the tibia. The swelling, in reality, is not so great as it seems, nor is there any appearance of fluctuation accompanying it. On the contrary, the joint retains its natural shape. These symptoms will generally be sufficient to enable the surgeon to distinguish between ulceration of the cartilages and synovial inflammation, particularly when the pain is increased by motion of the articular surfaces upon each other, and is so unrelenting at night as to rouse the patient from his sleep, which is seldom the case in the latter disease. In bad cases, however, of ulceration of the cartilages, or where the ulceration has extended to the soft parts covering the joint, luxation may arise, which will be characterized by distortion of the leg backwards, and unusual projection forwards of the condyles of the femur. In one specimen in my cabinet the heads of the tibia and fibula have abandoned the condyles entirely, and are lodged on the outer side of the shaft of the thigh bone, from destruction of all the ligaments by ulceration. Patients above the age of puberty are most subject to ulceration of the articular cartilages, and the disease is by no means uncommon even among persons advanced in age. Children, on the other hand, are occasionally the subjects of its attack.

But the true white swelling, such as it is considered by most writers, is undoubtedly that form of disease to which all the joints are more or less liable, which depends upon constitutional as well as local causes, and derives its origin, there is reason to believe, from scrofula; hence the term almost universally employed—scrofulous disease of the joints. It is characterized by a general swelling of the knee—the joint most frequently attacked—deep-seated pain in the head of the tibia, or about the centre of the joint, by emaciation of the thigh and leg, and by want of discoloration of the skin. These are the early symptoms, but as the disease advances others show themselves. The skin around the knee becomes very tense, is covered with varicose veins, has a shining aspect, and imparts, when felt, a sensation of heat.

After the lapse of several months or years, a considerable tumour is formed, not by the expansion of the bones, as was formerly supposed, but by a thickening of the soft parts; yet oftentimes, long before the knee attains any considerable magnitude, it becomes stiffened and permanently bent. In the end, matter collects within the cavity of the joint, whence it is discharged by ulcerated openings and sinuses; the bones are rendered carious, and the patient, if not relieved, dies from constitutional irritation.

TREATMENT OF WHITE SWELLING.

The remedies that have been found most useful in "*ulceration of the cartilages of joints*," are caustic issues, kept open by savin cerate, blisters, setons, and absolute rest of the affected part. It is not often, however, that we succeed, even if by these means the disease be gotten rid of, in preserving the motion of the joint. On the contrary, ankylosis commonly takes place, and indeed may be considered as the safeguard of the patient. Constitutional remedies, of course, should be conjoined with this local treatment, such as saline and antimonial preparations in the early stages of the disease, and bark and vegetable tonics as well as acids, when the patient's strength is declining. Sarsaparilla, calomel, and hyosciamus may also become necessary, under certain circumstances.

To relieve or remove the "*scrofulous disease of the joint*" will generally be found very difficult, inasmuch as little impression can be made upon the local affection, unless we succeed in eradicating the constitutional one. This should be attempted by those means formerly pointed out under the head of Scrofula.* The local remedies that have been found most serviceable, are perfect rest of the diseased joint, (which is best accomplished by the use of splints,) and moderate, long-continued pressure by adhesive straps. Blisters are sometimes beneficial, at other times injurious. The same remark will apply to issues and setons. In the advanced stages of this disease, the internal use of opium will be found greatly to mitigate the patient's sufferings. Amputation will, sometimes, on account of the constitutional dis-

* See ante, p. 157.

turbance, prove necessary. It should be remembered, however, that the removal of a limb affected with this disease, will occasionally give rise to pulmonary complaints, and other constitutional disorders, which may afterwards carry off the patient.

In every variety of white swelling where matter has formed within the joint, the surgeon ought carefully to abstain from letting it out, as such an operation has been found by experience only to aggravate the symptoms, and, indeed, in some instances, to produce most alarming and even fatal effects.

See Brodie's *Pathological and Surgical Observations on the Diseases of the Joints*, 8vo., London, 1838; Crowther's *Practical Observations on the Diseases of the Joints, commonly called White Swelling, &c.*, London, 1808; Russell on *Morbid Affections of the Knee Joint*, p. 20, 8vo., Edinburgh, 1802; Lloyd on the *Nature, &c., of Scrofula*, 8vo., London, 1821; Wilson's *Lectures on the Bones and Joints*; Boyer's *Treatise on Surgical Diseases*, by Stevens, vol. ii. p. 347.

SECTION XIV.

HYDRARTHROS, OR DROPSY OF THE JOINT.

THE synovial, like other serous membranes, sometimes pour out a thin fluid, which, by collecting within the cavities of joints, gives rise to dropsy. The disease, however, is seldom met with, and when it does occur, the knee joint is commonly the seat of it. Sometimes the cause of the complaint is very obscure, but generally it may be traced to cold, to rheumatism, or to the growth of cartilaginous bodies within the articulation. Occasionally it follows typhus fever, and in a few instances is, apparently, derived from syphilis or scrofula.

When the knee is attacked, there is a swelling on each side of the patella; this swelling is not painful to the touch, and imparts a decided sensation of fluctuation. The skin always retains its natural colour, even although the tumour should acquire uncommon magnitude. Sometimes the bursæ mucosæ are dis-

tended by fluid so as to resemble in some respects dropsy of the joint. In such cases, two circumscribed swellings are usually observed—one under the ligament of the patella, the other above that bone, and immediately beneath the tendon of the extensor muscles.

TREATMENT OF HYDRARTHROS.

This disease seldom admits of a perfect cure. Now and then the accumulated fluid is spontaneously absorbed, but it is very apt in a short time to be regenerated. Gimelle has highly extolled tartar emetic in large doses in hydrarthrus. Twenty-seven cases have been reported by him in which complete absorption took place in a short time from this remedy. Various local applications are usually resorted to, such as mercurial frictions, stimulating embrocations, dry rubbing, &c. But these are seldom productive of much benefit, and the surgeon must rely chiefly upon *blisters*, and well regulated *pressure* by the adhesive strap and roller. Some practitioners advise tapping of the joint, but no prudent or sensible man would incur the risk of violent inflammation, suppuration, and perhaps death, when it is well ascertained that there is no certainty of a radical cure being effected by the operation.

However, cases have been reported by Latta, Brodie, and other surgeons, where from inordinate distention of the joint or excessive accumulation of the fluid, accompanied by pain and inflammation, so much irritation has followed as to render such an operation necessary. As it may become expedient, then, to resort to such a measure, let it be remembered that numerous small punctures by an instrument resembling a couching needle, as advised by Sir Benjamin Brodie, followed up by the cupping-glass, will be the only plan likely to be attended with safety; and that, on the other hand, a large opening into the joint, will, almost to a certainty, be followed by tremendous symptoms, or death, or give rise to amputation.

See Russell's Treatise on the Morbid Affections of the Knee Joint, p. 63 and 191; Boyer's Treatise on Surgical Diseases, vol. ii. p. 399; Allan's Surgery, vol. ii. p. 145.

SECTION XV.

MOVEABLE CARTILAGE.

THE articulations of the lower jaw, elbow, knee, and ankle, and perhaps all other similar structures, are liable to be injured by the formation of cartilaginous or osseous bodies within their cavities. The knee joint, however, is commonly the seat of these excrescences, for such they may be called, inasmuch as it has been well ascertained that they derive their origin from the synovial membrane, which from taking on partial inflammation, throws out portions of coagulable lymph—afterwards rendered vascular and organized, and finally converted into cartilage and bone. In proof of this being the case, it need only be stated that these bodies are often found attached closely to the synovial membrane, or else connected to it by a pedicle; and that so long as this attachment continues, they increase in size or grow, but upon the pedicle being broken, as generally happens, sooner or later, by the movements of the articular surfaces, the cartilaginous bodies escape and move freely throughout the joint, and afterwards do not acquire additional bulk.

Some different views, however, have been brought forward recently; for, says Professor Cooper, “Sir Benjamin Brodie met with two cases in which the loose bodies were of a different nature, and had a different origin. In the two examples alluded to, this preternatural growth of bone had taken place, and in consequence of the motion of the parts, portions of it had been broken off, and lay loose in the cavity of the joint. And in a more recent publication he remarks, that in the majority of cases which he has met with, no inflammation preceded the formation of these preternatural substances, and therefore he thinks it probable that, in some instances, they are generated, like other tumours, by some different process. He further observes, that they appear to be situated originally either on the external surface, or in the substance of the synovial membrane; since before they become detached, a thin layer of the latter may be traced over them. This statement also agrees with the views formerly promulgated by Laennec and Béclard, and with those of Cruveilhier. The latter gentleman, indeed, has given

an engraving, representing some of them, as situated not only in the substance of the synovial membrane, but also in the cellular tissue external to it. Andral does not deny that these preternatural cartilaginous bodies may frequently form originally on the outside of the synovial membrane, as stated by Laennec, Béclard, Cruveilhier, and Sir Benjamin Brodie; but he observes, this cannot be the only mode in which they are produced.*

In consequence of moving throughout the joint, and sometimes gliding between the extremities of the bones, violent pain is created, and if the accident be often repeated, inflammation, with increase of the synovial fluid, is at last induced, and the patient suffers extremely. There are cases, however, in which the patients experience very little inconvenience from the complaint, even although the moveable bodies be numerous and large.

When removed from the joint and examined, these productions will be found to vary in size, consistence, number and shape. Some are not larger than a pea, whilst others nearly equal in size the knee pan. In general they are partly bony—the bone occupying the centre, and the cartilage the surface. In such cases they are smooth and polished, and resemble closely an articular cartilage. Sometimes, like ligament, they are soft, tough and tenacious. The number varies exceedingly, from a single one to twenty or thirty. They are commonly concave on one side, and convex on the other, and are longer than they are broad. If the knee joint be the seat of the complaint, these bodies may be readily felt to move from one part of the joint to another, and the capsular ligament is generally distended so much by the synovia, as to create an evident fluctuation.

TREATMENT OF MOVEABLE CARTILAGE.

The danger of cutting into the cavity of a joint, under any circumstances, is commonly imminent; such an operation should, therefore, if possible, be always avoided. But if the surgeon has tried ineffectually, in the cure of moveable cartilage of the knee, *bandages*, a *laced knee cap*, &c.—Which, if properly applied, sometimes retain fixed the cartilaginous body, and prevent it from exciting irritation—and the patient has been ap-

* Dictionary of Surgery, p. 849, 7th edit., London, 1838.

prized of the consequences that may possibly arise from an attempt to extract it, and under these circumstances, is willing to encounter the risk, the operation may be performed; provided the accumulation of synovia and the pain and inflammation be such as to endanger, eventually, the loss of life or limb, or to subject the sufferer to great inconvenience by interfering with or destroying his occupation.

Should the operation, under this view of the case, be determined upon, an incision may be made through the integuments and capsular ligament, the accumulated synovia discharged, and the moveable body extracted by a small pair of forceps, or turned out by the handle of the knife. The incision should never be larger than barely to admit of the passage of the cartilage, and ought always to be made in such a way, that the openings through the capsule and skin do not correspond when the lips of the wound are brought together. Care must also be taken, never to commence the incision until the surgeon feels that he has fixed the body securely, by his fingers at the spot at which he intends to extract it; for if it should slip from his grasp, he may find it impossible, afterwards, to bring it again into the same situation. With regard to the particular spot best adapted to the removal of the cartilage, a difference of opinion prevails; this must, however, always depend in a measure upon the situation which the body commonly occupies. As a general rule, the upper and inner side of the knee should be selected, in preference to any other part.

In several instances, I have performed this operation with complete success, and the patients have experienced little or no inconvenience from it; in other cases, two especially, most violent nervous symptoms, resembling those of tetanus, followed by high inflammation and profuse suppuration within the cavity of the joint, have speedily come on and nearly proved fatal.

It may be proper to remark, that in both these cases the moveable bodies were of uncommon magnitude, so that considerable difficulty was experienced in getting them out. In one of the cases,—that of Mrs. Deering, upon whom I operated in the University before the class, during the winter of 1822,—two bodies were extracted, each as large as a common-sized patella. In the other case,—that of Mr. John Lichtenwalter, of Lehigh county,—the cartilage was equally large and of very solid con-

sistence. Both patients were relieved by *very large* doses of opium, administered a few hours after the operation, and by keeping the limbs elevated upon inclined planes, and promoting the discharge of matter from the knee by poultices. Under this treatment, in a few weeks, both recovered—though with great difficulty.

Ford and Kirby, S. Cooper and others mention cases in which *death* has actually ensued from these operations.

“It is greatly to be desired,” says Kirby, “that these cases were set before the profession. Practitioners are too anxious to detail the particulars of their successful cases, and to conceal those, the events of which disappointed the hopes they at first entertained. In the vast field of practice it is surely not sufficient to direct us merely in the course which we ought to pursue. We should also be instructed in that which it is our interest to avoid, and should thus be guarded against the fatalities to which we are otherwise exposed, if urged by a spirit of empiricism, or innovation, we are induced to wander in search of new or uncommon remedies.”

See Hey's Practical Observations in Surgery, p. 342, 3d edit. 1814; Desault's Treatise on Fractures and Luxations, p. 316; Russell on the Knee Joint, p. 81; Home, in Transactions for the Improvement of Medical and Chirurgical Knowledge, vol. i. p. 229; Boyer's Treatise on Surgical Diseases, vol. ii. p. 333; Ford, in London Medical Observations and Inquiries, vol. v. p. 329; Abernethy's Surgical Works, vol. ii. p. 213, edit. 1819; Brodie's Pathological and Surgical Observations, p. 297; Kirby's Cases, p. 75.

SECTION XVI.

ANCHYLOSIS.

THIS disease has usually been divided by writers into *complete* and *incomplete*—a distinction, in a practical point of view, of some importance. It is for the most part symptomatic of other affections, and is particularly apt to follow injuries or inflammatory diseases of joints. In complete ankylosis, the liga-

ments, tendons, and surrounding cellular membrane are generally involved, and the joint admits of partial movement; but in complete ankylosis, the extremities of the bones, in many instances, become perfectly consolidated. There are a few beautiful specimens of this description in the Wistar Museum, and in my own cabinet.

One, especially, I possess, in which the leg is bent at a right angle with the thigh, and the condyles and head of the tibia so fused and blended with each other, without the slightest line of demarkation between them, as to resemble one bone, with a round opening at the centre of the original joint large enough to admit the finger. In two others, also, nearly similar, a dislocated patella is firmly attached to one of the condyles. Under the head of exostosis, I have mentioned several other examples of similar consolidation and have referred to numerous reported cases of the kind. Authors, indeed, are full of such cases. But the most remarkable, perhaps, on record, are the details furnished of the Indian fakirs, who from religious motives, condemn themselves to remain for many years in certain attitudes, and in consequence have all the joints permanently anchylosed in the position maintained for so long a period. The ginglymoidal articulations, from their complex structure, are more subject to ankylosis than those by enarthrosis.

TREATMENT OF ANCHYLOSIS.

By friction with stimulating articles, such as soap and volatile liniments, and gentle, often repeated, judicious movements of a joint, the *incomplete* ankylosis may frequently be cured in a few days or weeks. The operation should never be intrusted to the patient himself, or to an inexperienced person. From artificial and natural warm and hot baths, moreover, the most salutary effects often arise. Fortunately for American patients thus situated, the *Hot Springs* of Virginia, under the personal management of the intelligent and enterprising proprietor, Dr. Goode, are available at almost any season, and are better calculated, perhaps, to produce permanent cures than the baths of Germany or France—so long renowned for their virtues in these and other affections. I have seen several cases of incomplete ankylosis cured by machinery, under the management of Dr. Chase of this city. *Complete* ankylosis does not admit of cure

by the foregoing means; indeed, any attempt to overcome the stiffness by friction or by movement of the joint, would prove hurtful, by exciting inflammation or by breaking up adhesions, the formation of which had perhaps become essential towards the cure of some formidable disease—such as coxalgia, or white swelling. Indeed, in these and some other similar cases, the termination by ankylosis may be looked upon as a favourable result, and, in fact, as the cure. Whenever the surgeon finds complete ankylosis inevitable, and considers such an event desirable, he should always place the limb in such a position as will be afterwards most useful to the patient.

To supersede the necessity of amputation in certain grievous diseases of the joints, Mr. *Park*, of Liverpool, long ago suggested the idea of extirpating the heads of bones, and then placing their extremities above and below the joint as nearly as possible in contact, in order to procure reunion and ankylosis, or, in other words, so to speak, to convert two bones into one—thereby shortening the patient's limb, but saving him the inconvenience of an artificial one. The operation was performed, too, by the same surgeon, upon the knee and other joints, and with some success, though not without great suffering and long confinement on the part of the patients. About the period that *Park* performed his operations in England, *Moreau* was also engaged in similar attempts in France, and without the knowledge, it seems, of *Park's* experiments. The practice, however, never obtained many advocates in either country, and gradually sunk into oblivion, notwithstanding the efforts of Professor *Jeffray*,* of Glasgow, to revive it in 1806.

Since that period, however, a complete revolution has taken place in public opinion in relation to this interesting and important operation—chiefly from the report of cases by *Müller* of Gröningen, *Roux* of Paris, *Crampton* of Dublin, *Syme* of Edinburgh, *Spence* of Otley in Yorkshire, *Key* and *Liston* of London, and of several surgeons on the Continent of Europe and in our own country. It is not my intention, however, to enter into details, in this place, inasmuch as the operation is

* Cases of the excision of carious joints, by H. Park, Surgeon in the Liverpool Hospital. and P. F. Moreau, De bar-sur-ornain, M. D., de l'Ecole de Paris, with Observations by James Jeffray, M. D., Professor of Anatomy and Surgery in the College of Glasgow, 1806.

generally rendered necessary for other diseases than anchylosis.

An operation founded upon a different principle, has been suggested and successfully executed by an ingenious surgeon of this city, Dr. John R. Barton, for the relief of certain cases of anchylosis. It is well known that many patients have the misfortune to lose the use of a joint from injuries and the inflammation consequent thereto, from specific diseases, scrofula in particular, and from keeping the limb too long in the relaxed or extended positions. A case of this description presented itself to Dr. Barton—that of a sailor, in whom the hip-joint had been injured by a severe fall, and from which (by long confinement and bad treatment in a foreign hospital) anchylosis, great deformity and loss of the use of the limb ensued. After trying various expedients to straighten the limb, (for it was bent both at the hip and knee, and consequently shortened, and so inclined towards the sound limb as to interfere with its movements,) ineffectually, it occurred to Dr. Barton, that an artificial joint might possibly be established by sawing through the femur “at the lower part of its cervix, a little above its root.” The section was accordingly made by a narrow saw, forged for the purpose, the limb readily straightened, and so continued by being placed in the apparatus of Desault for the fractured thigh. The operation was severe, but did not last many minutes, and it was found unnecessary to secure any blood-vessels. For the first few days the patient was extremely ill, but soon recovered, and was so well by the sixtieth day as to be able to stand, with the aid of crutches, upon his feet, “both of which reached the floor:” and finally so far recovered as to be able to walk about without assistance and to execute many useful movements of the limb.

Dr. Barton does not pretend to recommend this operation in *every* case of anchylosis, but expressly states, he believes it “justifiable *only* under the following circumstances, *viz.* where the patient’s general health is good, and his constitution is sufficiently strong; where the rigidity is not confined to the soft parts, but is actually occasioned by a consolidation of the joint; where all the muscles and tendons that were essential to the ordinary movements of the former joint are sound, and not incorporated by firm adhesions with the adjacent structure; where the disease causing the deformity has entirely subsided; where the

operation can be performed through the original point of motion, or so near to it, that the use of most of the tendons and muscles will not be lost; and finally, where the deformity or inconvenience is such, as will induce the patient to endure the pain and incur the risk of an operation."

Fifteen years have now elapsed since the operation referred to was performed, during the greater part of which time the patient was able to walk about, with surprising activity, and without the aid of a crutch or cane. Having latterly met with misfortunes, he became intemperate, and repeatedly injured, by falls and bruises, the new-made joint. During the winter of 1835, he died, and upon post-mortem examination by Dr. Barton, it was found that complete reunion had been established, through the medium of ankylosis, between the ends of the bones formerly divided by the saw, and the artificial joint thereby destroyed—owing, as Dr. Barton believes, to the injuries mentioned, and to inordinate movements of the joint, upon various occasions, before the inflammation consequent to the operation had entirely subsided. One or two other cases of the kind have been reported by Dr. Barton, but in none, as far as I can learn, has artificial joint formed.

In the last edition of the Dictionary of Surgery, (1838) by my friend Professor Cooper, mention is made of an operation of this description previously performed by Mr. Anthony White, of London. From the details furnished, however, I am inclined to believe that Mr. White's operation was performed upon the remains of the diseased *joint*, and not, as in Dr. Barton's case, upon the *cervix* of the bone. It is important to draw this distinction, because there is reason to believe that Dr. Barton's plan would be much more likely to succeed, or at least, not to be followed by untoward consequences. In Mr. White's case, the patient regained considerable latitude in the motion of the limb. My impression, however, is, that we shall never be able to calculate, after such operations, upon the establishment of a new or artificial joint, but that ankylosis will generally result. But it is only fair to acknowledge, that Dr. Barton's patient enjoyed the use of his artificial joint for six years—though he lost it, eventually, "by intemperance, abuse of health, &c."

A second operation upon the same principle, but without the design of establishing an artificial joint, was performed by Dr. Barton in 1835, and an account published of it in the Journal of

Medical Sciences for 1838. The following extracts will show the nature of the operation and the subsequent treatment. "S. D., M. D., formerly of Charleston, S. C., but now a resident of Alabama, when a youth of about nine years of age, unhappily had his knee joint involved in inflammation and suppuration so extensively, as to occasion the destruction of the synovial membranes, the ligaments, cartilages, and in short, every structure peculiarly appertaining to the joint. After protracted suffering, he finally recovered with the loss of the joint; the tibia, femur, and patella having been united to each other in the form of a true anchylosis. The loss of the articulation of the knee, however, though a misfortune, did not constitute the *sadness* of his case. It was caused by the malposition of the limb; the leg having been fixed upon the thigh to a degree somewhat less than a right angle. Hence the only alternatives, of which he could avail himself to aid him in walking were, either to use crutches, or to employ a very high block-sole boot, and to lower his stature, by fixing the sound limb, in order that both feet might reach the ground. The latter expedient he adopted. The long-continued pressure and weight of the body, sustained by this defective limb, acting under such great mechanical disadvantages, had at length caused some projection of the instep, and other irregularities, which it is unnecessary to particularize.

"This supposed irremediable condition of his limb, with all its ills, the young gentleman endured during the period of about sixteen years. In the mean time he graduated in medicine, and became a successful and highly respectable practitioner; but as his professional labours increased, he found the condition of his limb to be an obstacle not only to his further success, but also a source of unceasing annoyance and vexation. Whereupon, with a resolution not surprising to those who knew the strength of his mind, the firmness of his character, and the abundance of his manly courage, he repaired to Philadelphia in order that some relief might be obtained, if it were possible. When consulted by him, I found him fully prepared to learn that no benefit was to be expected from any heretofore known practice, and that if he could be relieved, it must be by some novel expedient and treatment.

"After a candid and full disclosure of my views of his case and of the means by which I thought he might be benefited, his

own judgment accorded with mine, and believing in the feasibility of the plans, he became urgent for the undertaking. It was accordingly commenced on the 27th day of May, 1835, and pursued as follows:—

“Two incisions were made over the femur, just above the patella. The first commenced at a point opposite the upper and anterior margin of the external condyle of the femur, and passing obliquely across the part of the thigh, terminated on the inner side. The second incision commenced also on the outer side, about two and a half inches above the first, and passing likewise obliquely across the thigh, terminated with the other in an acute angle. By these incisions were divided the integuments, the tendon of the extensor muscles of the leg, at its insertion into the upper part of the patella, and some of the contiguous fibres of the rectus and crureus muscles themselves, a greater part of the vastus internus, and a portion of the vastus externus muscles. A flap composed, therefore, of this structure, was elevated from the femur close to the condyles. The soft parts were next detached from the outer side of the bone, from the base of the flap towards the ham, by passing a knife over the circumference of it, so as to admit of the use of a saw. The flap being thus turned aside, a triangular or wedge-like piece of the femur was easily removed by means of a small narrow-bladed saw, such as was used in the operation at the hip. This wedge of bone did not include the entire diameter of the femur at the point of section; so that a few lines of the posterior portion of the shaft of the bone remained yet undivided. By slightly inclining the leg backwards, these yielded, and the solution was complete. This mode of effecting the lesion of the bone was designedly adopted, and constituted what I conceived to be a very important measure in the operation. Important, because it rendered the popliteal artery free from the danger of being wounded by the action of the saw, and subsequently the interlocking of the fractured surfaces tended to retain the extremities of the divided bone in their positions until the harshness of their surfaces had been overcome either by the absorption of their angle, or by the deposition of new matter upon them—a change essential to the safety of the artery during the subsequent treatment of the case. Not a blood-vessel was opened which required either a ligature or compression. The operation, which lasted about five minutes, being thus ended, the reflected flap was returned to its

place, the wound lightly dressed, and the patient was put to bed, lying on his back, with the limb supported upon a splint *of an angle corresponding to that of the knee previous to the operation*. This position was maintained until it was believed that the asperities of the bone had become blunted, and were not likely by their pressure to cause ulceration of the artery beneath them. This first splint was then removed and another having the angle slightly obtuse was substituted. In a few days a third splint with the angle more obtuse than that of the second, supplied its place. Others, varying in degrees of angularity, in like manner, came in their turn to support the limb until it had attained a position almost straight. It was then unchangeably continued in that line until the contact surfaces of the bone had united and securely formed the limb in this the desired direction.

“During the treatment of the case, especial care was bestowed in protecting the popliteal vessels against any injurious encroachment upon them. With that view, all antagonizing pressure on the soft parts in the ham was carefully avoided. The limb was rested on two long bran bags, lain upon the splint, with their ends apart—a vacancy of four or five inches being left between them opposite the lesion of the bone. This interspace was lightly filled with carded cotton, so as to afford a safe support. Every symptom of pain or uneasiness in this part was promptly attended to. The occasional issue of a drop of blood from the corner of the sore, during the process of dressing the limb, caused me some solicitude in this case; whereas, ordinarily, I should have considered it as a matter of no moment—it being so frequent an occurrence during the dressing of wounds, owing to the disturbance of the granulations, especially in compound fractures. The wounded soft parts finally healed and quieted his anxiety. The straightening of the limb having been very cautiously and by degrees effected, the first two months elapsed during the accomplishment of this object. Having then reduced it to the desired position, means were carefully observed to retain it so until the reunion of the bone had been fully completed; which occupied two months longer. The constitutional symptoms were such as usually occur in compound fracture—somewhat severe, but at no time alarming. Throughout the whole treatment it was not found necessary to bleed him, or to have recourse to any active constitutional measures. He was occasionally indisposed from irregularities in the digestive function, but was always

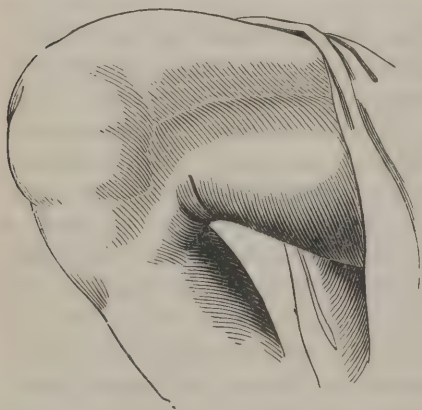
speedily relieved by resorting to mild and appropriate remedies.

“After the end of four months from the date of the operation, my patient stood erect, with both feet in their natural position, and the heels resting alike upon the floor, although a slight angle had been designedly left at the knee, in order that there might not be any necessity for throwing the limb out from the body in the act of walking, which is always the case when the knee is quite straight. After this period, the use of shoes of the ordinary shape was resumed, and the limb was daily exercised with increasing strength and usefulness. On the 19th of October, the Doctor took his departure for the south, bearing with him the injunction to continue the support of a small splint, and the aid of a crutch or cane, until he should acquire sufficient confidence in the strength of the limb to justify him in laying them aside.”

In a letter received by Dr. Barton from his patient in 1837, nearly two years after the cure, the latter remarks, “I have the satisfaction and pleasure of saying to you now, that the operation you performed on my leg has been *completely* successful, and has more than realized my most sanguine anticipations. The small abscess which you dressed the day before we parted at Norfolk, continued open, and threw out, from time to time, small pieces of bone, until the August after, when the last piece was discharged; the orifice then closed, and I have suffered no material inconvenience from it since. From the January previous, however, I was going about attending to my professional business; and early in the summer, when our sickly season commenced, I was on horseback daily, riding from thirty to fifty miles a day; without more than the ordinary fatigue or inconvenience. I am at present well; the wound sound; and I feel no other inconvenience in riding or walking than what arises from my knee joint being stiff, which was the case before you performed the operation. I walk without a stick or other aid, with the sole of the foot to the ground, and my friends tell me with but a slight limp; and I have great pleasure in adding, that the leg and foot have increased considerably in size, so as now to be nearly equal to the other. When I think of what I was, and what I am; and that to your firmness, judgment and skill I am indebted for the happy change, I want words to express adequately all I feel, &c., &c.”

During the month of November, 1841, a very interesting case of complete ankylosis of the knee, similar in many respects to that of Dr. Barton, presented itself to me, and was successfully treated by a similar operation, an account of which was drawn up and published, at my request, in the 7th number of the American Journal of Medical Sciences, for July, 1842, by Dr. Thomas L. Walker, of Albemarle, Virginia, then a resident physician of the Philadelphia Hospital.

"Last fall," says Dr. Walker, "during the attendance of Dr. Gibson as surgeon to the Philadelphia Hospital, James Johnston, coloured, ætat 17, was admitted. He, two years previously, whilst cutting with an axe, inflicted upon his right knee a wound, of which nothing more is known than that he recovered with a loss of the joint, and with the leg flexed backwards towards the thigh. In this situation he entered the Hospital, the leg,



being so flexed as to form an angle much less than a right angle with the thigh—(as shown by the accompanying fig.) He came in, determined to submit to an operation, and expressed great anxiety that it should be performed. A careful examination satisfied Dr. Gibson that the parts belonging to the joint were all

destroyed:—ligaments, cartilages, and the synovial membranes; and that it was a case of complete ankylosis. As in the patient last operated upon by Dr. Barton, he (Dr. G.) did not think that circumstances justified his attempting the double indication of forming a false joint and extending the limb too. His only aim, therefore, was to correct its malposition. Accordingly, every thing seeming to favour the operation, both as to the will and robust health of the patient, and the entire concurrence of other surgeons consulted by Dr. Gibson, it was determined on.

"Nov. 17th, 1841.—The patient having been for several days restricted in his diet, was brought forward, prepared for the operation. Before a full attendance of medical students and many

eminent physicians, the proposed operation was explained by Dr. Gibson; after which he proceeded as follows: Two incisions were made, as in the operation of Dr. Barton; the first extending from the outer to the inner side of the limb, and passing immediately above the patella; the second commencing on the outer side, two and a half inches above the first, and meeting it at an acute angle on the inner side. These incisions penetrated to the bone, engaging the integuments, the tendon of the extensor muscles, and some of their fibres. The soft parts included between the incisions being dissected off and turned back, the bone was exposed to view. A portion of the femur, of a wedge shape, was then removed with the saw, having a base upwards of two inches and a half anteriorly, and reaching to within a few lines of the posterior surface of the bone. The operation was then concluded by inclining the leg backwards, which caused that portion of the bone's diameter, undivided by the saw, readily to yield, and the solution of continuity to be made complete. This method of accomplishing the separation of the bone was regarded as an important step in the operation, inasmuch as it guarded the popliteal artery against wounds from the saw; and the dove-tailed edges of the opposed surfaces were influential in binding the extremities of the bones, until the extremities of their surface were removed by the absorption, or by the formation of new matter. No blood-vessels were divided requiring the ligature or compression. The operation was completed in a few minutes, and the flap being returned to its place, and secured by the interrupted suture, light dressings were applied. The patient lying upon his back, was put to bed with the limb supported upon a double inclined plane, having an angle correspondent to that of the knee before the operation. As great care was necessary to provide against pressure upon the popliteal vessel, the limb reposed on two bran bags which were fastened to the edges of the plane, so fashioned that its angularity could be varied, without being removed from beneath the leg as its extension might require. The vacancy between the bags was carefully supplied with cotton. Very slight hemorrhage followed, which, proceeding from the division of one of the articular arteries, stopped spontaneously in a short time; and except a slight oozing, which continued for two days, there was no sign of hemorrhage afterwards.

"In the evening the patient suffered very little pain; com-

plaining only of a slight uneasiness in the inguinal region, which was attributed to the position of the limb, was indisposed to sleep, consequently took fifty drops of laudanum.

"18th.—Passed a comfortable night; was without pain, and felt perfectly easy; oozing from knee very inconsiderable; rigidity of muscles diminished, and leg less contracted.

"19th.—Slept all night without pain. Pulse full, strong and regular, (about 72 in the minute.) Leg had by force of gravitation extended itself a good deal.

"20th.—Enjoyed undisturbed sleep throughout the night without any laudanum; complains of slight pain opposite the lesion of the bone; no fever; appetite good; bowels opened naturally. The dressings removed for the first time, and the leg allowed to extend itself. Measurement proved the height of the angle to be diminished by three-quarters of an inch. Simple dressings applied again.

"21st.—Continued to do well. No fever or pain; towards evening, slight uneasiness endured, from the stretching of the tendons. Extension of leg increased by full another inch.

"23d.—Limb approaching the extended condition rapidly. No fever. In consequence of slight pain experienced, patient allowed forty drops of laudanum.

"24th.—Bowels again opened. Passed a restless night, from pain in the foot, caused by the heel accidentally coming in contact with the splint. Suppuration commenced. Laudanum repeated.

"25th.—Entirely free from pain. Bowels again opened. No fever. The extension of the leg required the splint to be let out. The extension progressed so rapidly, that a pad was applied to the sole of the foot, by which resistance was opposed to the direction of the elongation of the leg.

"26th.—Wound discharged freely. Pulse a little accelerated. Towards evening the knee stripped and newly dressed. Sutures all free.

"Dec. 5th.—Between the 26th of Nov. and 5th of Dec. nothing transpired worthy of being mentioned. The patient continued uniformly to improve, the limb to extend itself, and his general health such as to require no interference on the part of the surgeon. On the 5th the straightening of the limb was sufficient to justify the removal of the splint, for which a simple box

was substituted. This was carefully lined with carded cotton, no part of the leg or foot being suffered to rest upon the wood. The comparative length of the two limbs was taken, measuring from anterior superior process of the ilium downwards. As far as accurate measurement was obtained, we were induced to give the sound limb an excess of an inch and a half.

"11th.—Since the date of the preceding note, the patient's condition was very favourable. No unpleasant symptom appeared. The wound continued to heal. Suppuration was so abundant as to require two dressings daily. Had no pain. Slept naturally. Appetite was good, and digestive functions perfect. In consequence of the too rapid growth of granulations, red precipitate ointment was applied to the wound of integuments, and sponge tent introduced into the upper incision, to favour the escape of pus. Tumefaction of the knee commenced. Pulse somewhat excited.

"16th.—Wound improved regularly after the application of the ointment. Tumefaction of the knee increased. No pain endured. The secretion of pus was so copious, that an opening was made near the head of the fibula,—which situation being more depending, matter to the amount of eight ounces flowed out. Symptoms of debility now began to manifest themselves. Pulse was quickened, 112. Appetite continued good, and bowels naturally soluble.

"23d.—Progressive improvement. Except the irritation symptomatic of the free suppuration, nothing was observed. The pulse was regularly excited, though the patient always expressed himself as being perfectly comfortable. Tumefaction of knee diminished.

"Jan. 5th, 1842.—From the 23d of December to this time, suppuration continued free. The orifice made with the lancet enlarged itself by ulceration. Pulse remained quick, but general appearance improved. In consequence of a sinus seeming to run up the thigh, a seton was introduced through the opening opposite the lesion of the bone, and brought out two inches above.

"12th.—The tape withdrawn. The discharge diminished. The bones were found to be firmly united. Patient was allowed to sit up, with the leg supported at a right angle with his body.

"26th.—Patient able to walk with the assistance of crutches. Wound not entirely healed.



"Feb. 15th.—Wound every where closed. Could bear the weight of his body with difficulty. The leg shortened nearly an inch. Walked without the enclosure, assisted by crutches. General health perfect.

"May 1st.—For the last two months the patient has walked about continually without the use of a crutch or a stick; and latterly has been to town and back on foot,—having walked three or four miles without the slightest inconvenience. The accompanying figure shows the present appearance of the knee. The limb at this time is only half an inch shorter than the other."

I will only add to this interesting report of Dr. Walker, that the patient may be said to have recovered perfectly in less than six months, that after leaving the hospital he lived some time in my employment as an ostler, and was able to perform satisfactorily the duties of his station.

In the *Western Journal of Medicine and Surgery*, a case has recently been reported by Dr. Kilpatrick, in which Dr. Burr, of Cheneyville, Louisiana, performed an operation in December, 1841, under circumstances so similar to those just reported, as might induce any one to believe that both accounts referred to the same patient.

Consult Boyer's *Lectures on the Diseases of the Bones*, vol. ii. p. 253; Boyer's *Treatise on Surgical Diseases*, vol. ii. p. 366; Russel on the Knee Joint, p. 222; Barton on the Treatment of Anchylosis, by the Formation of Artificial Joints, &c., in the *North American Medical and Surgical Journal*, vol. iii. p. 279.

On Excision or Resection of Joints, consult Jeffray's *Cases*, Glasgow, 1805; Roux de la Resection des Portions d'Os Malad. Paris, 1812; Crampton, in *Dublin Hospital Reports*, vol. iv.; Velpeau, *Nouv. Elém. de Med. Op.* tom. i.; Syme on Excision of Diseased Joints, edit. 1831, and *Principles of Surgery*, 1837; Liston's *Practical Surgery*, 1839.

SECTION XVII.

HYDRO-RACHITIS, OR SPINA BIFIDA.

THIS is a congenital deformity, or imperfection, occasionally met with. There is a deficiency of some particular portion of the spinal column, through which the medullary sheath projects beneath the integuments, in the form of a tumour, and contains in most instances a thin transparent serum. Commonly the opening is situated in the lumbar region, occasionally in the dorsal, and rarely in the cervical region. Sometimes the sacrum is the seat of the disease. In almost every instance, the spinous processes of the vertebræ are deficient, and consequently the tumour occupies the posterior part of the spine. The size of the opening varies according to the number of the vertebræ involved, and hence the tumour is proportionably large or small. It rarely exceeds in magnitude the size of the fist, and is seldom smaller than that of an egg. The skin covering the tumour is generally extremely smooth, delicate and thin; and sometimes single venous and arterial branches irregularly occupy its surface. The sheath of the spinal marrow, too, is often very much attenuated, and hence the fluid can be distinctly seen through the coverings, and fluctuates upon the slightest pressure. I have met with a few instances in which the skin retained its natural thickness, and with others in which it was rugose and thicker than natural. In these cases the fluid, of course, could not be seen. Sometimes the fluid, instead of possessing transparency, is thick, flocculent, and turbid. In almost every case the swelling can be made to disappear by steadily pressing upon it, but returns as soon as the pressure is discontinued. The patient, however, always suffers more or less, and symptoms resembling those of compression of the brain, have been induced to an alarming degree by any attempt of the kind.

This disease is often connected with hydrocephalus; sometimes it is followed by extreme debility, diarrhœa, ischuria, paralysis of the lower extremities. Some patients, on the contrary, are healthy and vigorous. Few, however, survive for many months; though I have met with four or five instances in which the patient lived to the third or fourth year; and one case

I remember to have seen with Professor Henderson, of Georgetown, in which the patient had reached her sixteenth year, notwithstanding spina bifida had occupied the greater part of the sacrum and had attained an enormous size. A very interesting case of the same disease has also been furnished me by Dr. John T. Lewis, of Eatontown, New Jersey. "At birth," says Dr. Lewis, "the patient had spina bifida in its usual form; but the tumour soon increased in size, and the contained fluid would for several years, when pressed, recede into the osseous case. The tumour is now situated about three inches and a half above the coccyx on the lower lumbar vertebræ. It cannot, at present, be lessened by pressure; nor does pressure produce the least uneasiness. It is pendulous, and measures at the neck *thirteen* inches in circumference, and *twenty* in its largest transverse diameter, resembling an uncommonly large bladder filled with water. The tumour, when examined in a dark room, with a lighted candle opposed, is transparent throughout except for a few inches at its neck, where it has a dark appearance, produced, as I believe, from a number of blood-vessels passing from the aperture of the vertebral column, the opacity becoming less and less as they give off their branches to the tumour. The integument covering this hernia (if it may be so called) is of the natural colour of the skin, and appears uncommonly strong and thick, with the exception of a spot nearly the size of a dollar, which protrudes an inch beyond the tumour, and is quite thin, and will, no doubt, ultimately give way and terminate the existence of this unfortunate individual. He is now twenty-six years and six months old, five feet four inches in height; his countenance is pale, yet his health is tolerably good; his lower extremities are small and weak, but otherwise he is well proportioned; he frequently walks eight miles a day. Within the last year he complains of numbness in his knees."

On the 14th of August, 1837, accompanied by Drs. Lewis and René La Roche, I visited this patient, and found his case to correspond with the above statement—with the exception of a slight increase in the size of the tumour, and a condensation of the skin covering the soft spot referred to. He, however, is considerably emaciated, and complains of giddiness of the head, and numbness of the lower extremities when pressure is made upon the tumour. He is evidently, moreover, sinking from phthisis pulmonalis.

An interesting case of this disease, which occupied the *cranium*, instead of the spine, I was called to visit in January, 1835. Mr. Crewson, the father of the child, who resides in Callowhill Street, informed me that at birth the tumour was the size of a large orange. When I saw it, six weeks after birth, it was pyriform and half as large as the child's head, connected by a pedicle, about an inch in diameter, with the centre of the occiput, through an opening in which, it communicated directly with the brain. The tumour was of a dark purple colour, soft and fluctuating, and, apparently, very vascular. The child died shortly after my visit, and the tumour, upon being opened by Dr. Walton, as the mother afterwards informed me, was found to contain a considerable quantity of fluid, in consistence and colour resembling turbid serum.

TREATMENT OF HYDRO-RACHITIS.

Many fruitless attempts having been made by Ruysch and some others among the older surgeons, to effect a cure of spina bifida by pressure, and by acupuncturation, the disease was universally considered as beyond the reach of surgery, until within the last few years, when, by the means referred to, Sir Astley Cooper was enabled to furnish two instances of successful termination. In the first instance the tumour was gradually obliterated by pressure kept up in the commencement by a common roller, and afterwards by a regular truss, made expressly for the purpose. In the second case, the fluid was evacuated repeatedly and for months together, with a fine needle, care being taken not to draw off the whole of the fluid at once, and afterwards to prevent the punctures from taking on ulceration. These patients, it is stated,* have now arrived at their nineteenth year, and are stout and healthy. Two other cases of a similar character have since been cured under the management of Sir Astley Cooper. Hickman and Pearson, two English surgeons, and Probart of Hawarden, have each succeeded in curing a patient by the same means; so that, in all, the lives of seven patients have been saved through the medium of compression and acupuncturation.†

* Bamfield on the Spine.

† Bozetti reports two cures of this disease by acupuncturation.

Under these circumstances, no doubt can be entertained of the value of the remedy; yet it must be confessed, that there is hardly a possibility of its succeeding except in cases of the most favourable description—where the tumour is small, the limb free from paralysis, the intestinal and urinary functions undisturbed, the absence of hydrocephalus, &c. But it is proper to state that even under very favourable circumstances, acupuncture has been tried in many instances without effect, and sometimes with a fatal result, owing to ulceration being induced by irritation from repeated introduction of the needle. Several cases of this description have come under my notice, and others have been reported to me.

It would seem almost superfluous to state, that the sudden evacuation of the whole of the fluid contained in the cyst of a spina bifida, will be followed generally by convulsions and death. Three cases of the kind I have witnessed—the physician having, in each case, mistaken the nature of the complaint, and plunged a lancet into the tumour.

The following case under my care during the winter of 1834, at the Philadelphia Hospital, and which I placed under the particular management of Dr. Charles Skinner, of North Carolina, then a resident physician of the hospital, now one of the most respectable practitioners of his state, will be found in many respects interesting. The account is drawn up by Dr. Skinner, and is, in detached portions, transferred to these pages. “Dec. 5th, 1834, Matilda M'Cormick, aged seventeen months; very fair complexion, light hair, blue eyes, tolerably well grown for her age, and of a very sprightly disposition. The mother states that at birth a tumour of the size and appearance of an ordinary blue plum, was observed on the inferior portion of the loins. On the surface of this tumour, there was a small excoriated surface, from which a sanious discharge took place. The tumour has increased very gradually, and is at present more than three and a half inches in length, two and a half in breadth, and one and a half in depth; and extends in the form of a flattened oval, for a line with the crest of the ossa ilia, to near the verge of the anus; but after crawling or crying it is much larger. It is diaphanous, and fluctuates very distinctly. The integuments are of a natural thickness and appearance, with the exception of a spot one inch in diameter, on the inferior portion of its surface, which is smooth, shining, and red, and resembles a cicatrix; but, if

the tumour be subjected to much friction, it becomes universally of a light pink colour. If firm pressure be made for some time, the tumour becomes so much diminished as to permit the opening into the spinal canal to be felt, which is smooth and oval-shaped, with a small fissure extending downwards, is large enough to admit the end of the little finger, and appears to be caused by a deficiency in the last lumbar vertebra, or inferior portion of the sacrum."

"The health of the child has been uniformly very good; her appetite is excellent, and urination and defecation are performed naturally. She is very intelligent, and her head, though large, is not unusually so. She can sit or lie on the tumour, without the slightest inconvenience, and firm pressure produces no unpleasant symptoms. She cannot walk, but uses her lower extremities very freely in crawling, and can stand when holding by an object.

"At the suggestion of Dr. Gibson, I punctured the tumour on the 7th, with a very fine needle, but obtained only a few drops of fluid, when the orifice entirely closed. Two days subsequently, I repeated the operation with a much larger needle, and drew off half an ounce of a perfectly limpid fluid, resembling pure water. The closing of the puncture again put a stop to the discharge of the fluid."

Between the seventeenth of January, and the 10th of April, following, the operation was frequently repeated, generally with a small trocar instead of the needle, and large quantities of fluid drawn off each time. A manifest change had taken place in the tumour. At this period, however, "the child was visited by its mother, who gave it a sour orange, which immediately produced a diarrhœa. The operations were consequently suspended, and under the use of anodynes, with low diet, the disease gradually improved until the fourteenth, when it was apparently arrested. The diarrhœa returned, however, within a few days, and baffling all attempts to arrest its progress, terminated fatally.

"This was undoubtedly a case of local spina bifida—one in which neither hydrocephalus, extensive disease of the spinal cord, nor any malformation existed. It is to such cases that the curative plan of treatment has been very justly restricted. The *established practice* was departed from, however, in one particular, namely, in repeatedly evacuating the tumour at one

operation. I think there can be no doubt as to the favourable termination of the case, but for the unfortunate supervention of the diarrhœa and pneumonia. The tumour had been punctured seventy times without any serious accident, was reduced to less than one-fourth of its original size, and would, probably, in a short time have been obliterated, the thickened sac would have ceased to secrete, and by the use of a proper truss or compress, would have become, in a short time, adherent to the opening into the spinal cavity, and prevented the fluid of the cord from reproducing the tumour. The autopsy rendered it very evident that the tumour had no share in the production of death—that was the result of the inflammation of the alimentary canal and lungs. The inflammation of the bronchial mucous membrane, especially, must have been very intense, to have produced the effusion of pus which was observed. The quantity of fluid drawn off during the progress of the case, was more than four pints, its specific quantity was 1—15; taste slightly saline, odour at first slight; but, after standing a few days, fetid, and resembling that of the liquor of oysters.”

See some observations on Spina Bifida, by Sir Astley Cooper, in *Medico-Chirurgical Transactions*, vol. ii. p. 322; Cooper's *First Lines of the Practice of Surgery*, vol. ii. p. 360; *Dictionnaire des Sciences Médicales*, tom. xxii., Article Hydro-rachitis; Bamfield on Curvatures and Diseases of the Spine; Vacca, in the *Edinburgh Medical Journal*, vol. xvii. p. 251; Case of Spina Bifida, with remarks by Charles Skinner, M. D., in *American Journal of Medical Sciences*, No. xxxi., Nov. 1836.

CHAPTER X.

DEFORMITIES.

DEFORMITIES, or distortions of various kinds, may occur in different parts of the body, and arise from numerous causes. They are generally dependent, however, upon malformation, or disease of the joints; upon contraction or relaxation of muscles or tendons; upon injuries; upon general debility and other constitutional affections; upon the indulgence in awkward habits, or unnatural attitudes; upon artificial contrivances and capricious and injurious modes of dress. Thus, from white swellings or caries of the joints, complete or incomplete ankylosis and deformity may arise; from carelessness and tight lacing,* cur-

* The following case, well calculated to show the effect of tight lacing, was obligingly communicated to me, a short time ago, by my intelligent friend, Dr. Isaac Thomas, of West Chester.

"Miss ———, aged about seventeen years, had been suffering for several months from paroxysms of violent palpitation of the heart and oppressed respiration, coming on at intervals of various duration, the intervals being occasionally of several weeks, and at other times much shorter. On the evening of the 21st of May last, she was suddenly seized with a similar paroxysm, which continued during the night, and early in the morning following, Dr. P. S. Conner was called to see her. He found her in a drowsy state somewhat resembling stupor, with violent palpitation of the heart, which caused the ribs to bound under the hand when laid upon them, and was perceptible to the eye. The face was somewhat flushed, pulse frequent, not strong, nor full; it soon, however, diminished in frequency and force, and sank so low as to require the use of stimulants, although some of the earlier symptoms indicated the use of the lancet, which was not resorted to. On former occasions, after a paroxysm had subsided, she would have spells approaching to syncope, and was restored by the use of mild stimulants, and under the same treatment rallied a little on the present occasion, for a short period, but death closed the scene about one o'clock in the afternoon. On the following day I assisted Doctors Worthington and Conner, in making a post obit examination. We found the chest very much contracted, evidently caused by tight lacing; so much so, indeed, that the cartilages of the lower ribs, on the opposite sides, were brought nearly in contact for a space of four inches below the ensiform cartilage, and carried downwards so as to nearly approach the crista of the ilia on each side.

vatures of the spine; *round* shoulders, as they are called, from the habit acquired by children of throwing their arms forwards, and supporting them on the front of the chest; elevation of one shoulder or depression of the other, by the habit of leaning to one side in the act of writing, reading, or drawing, or whilst engaged in needle-work, or various sedentary employments. Again, the joints of the hip and knee may be deformed. The latter is most frequent, and the distortion either inwards or outwards. In the former case the patient is said to be *knock-kneed*—in the latter *bow-legged*. Some of these affections have been already noticed, and others remain to be considered. These are ruptures of muscular fibres or tendons, contractions of fingers, toes, and other joints, and that affection—commonly congenital—known by the name of club-foot.

SECTION I.

RUPTURE OF TENDO ACHILLIS.

RUPTURE of muscular fibres may take place from violent exertions in any part of the body; but the biceps flexor cubiti, and

The liver was much larger than natural, occupying the natural situation of the stomach, the great curvature of which rested in the left iliac fossa. The lumbar vertebræ advanced forwards so as to nearly approach the anterior parietes of the abdomen, and the intestines were chiefly contained in the cavity of the pelvis. There was no very evident disease of the contents of the abdomen, except, as I have observed, of the liver and the mucous coat of the stomach, which presented an appearance of too much redness to be altogether healthy. The heart was somewhat increased in size, and the right auricle contained a mass of what appeared to be indurated coagulable lymph, of the size of a pheasant's egg flattened, resembling adipose matter very much in appearance, attached by a pedicle to the septum, between the auricle and right ventricle. The right ventricle also contained a mass of the same kind of substance, three or four inches in length, which extended into the pulmonary arteries, and consequently prevented the valves from closing. There was congestion of the lungs; on the left side the lower lobe appeared in a hepatized condition, but our time was too limited to make a full examination of them."

extensors of the leg are most apt to suffer. The gastrocnemius, especially, is very apt to be torn in persons unaccustomed to much exercise, as in middle-aged or old people, who, forgetting themselves, sometimes aim at sudden feats of agility by capering with young partners at a dance, or attempting to cut pigeon-wing, or to perform similar inappropriate exploits. Sometimes, however, muscular fibres are torn by very slight efforts, both in young and old subjects. The accident is almost unknown among rope-dancers, circus-riders, posture-makers, and persons engaged in similar occupations.

But of these different accidents, rupture of the tendo Achillis is the most frequent. It may be known by the loud snap, or report, which instantaneously follows the rupture; by the patient generally falling to the ground, and being unable to rise without assistance; and when up, finding it difficult to walk or stand; by the retraction of the belly of the muscle upon the leg; and by the space, or wide separation, between it and the torn tendon; into which chasm the integuments can be pressed without difficulty, so as to leave a very sensible and obvious depression externally. Sometimes instead of a snap being heard, the patient has experienced the sensation of a smart rap on the leg from a rattan or stick. In Dr. Monro's case the symptoms were peculiar—a loud crack being first heard, as if he had crushed a nut with his heel, followed by a sensation of the shoe having perforated the floor. Division of the tendo Achillis by a cutting instrument will necessarily give rise to the same symptoms,—with exception of the absence of snap or report. A few cases of this latter accident I have met with among workmen—generally produced by stepping upon the edge of a drawing-knife or corner of an adze, accidentally projecting among shavings on the floor of their shop.

TREATMENT OF RUPTURE OF TENDO ACHILLIS.

Laceration of the fibres of the gastrocnemius, or other muscles, should be treated by rest, position, and bandages,—the limb being so placed as to take off strain from the affected part. There are various modes of managing the ruptured tendo Achillis, all founded upon the same principle, differing only from each other in being more or less simple or complicated. Desault's

plan was to bend the thigh on the pelvis, the leg on the thigh, and to *extend* the foot on the leg; and having in this way brought the ends of the ruptured tendon in contact, to retain them there by filling up the hollows on each side of the tendon with lint and compresses, fixing a bandage on the sole of the foot, carrying it upwards over the back of the leg and thigh, and encircling the whole limb from the toes to the groin by a roller, calculated by pressure to subdue muscular action, and prevent the limb from being moved from the position in which it was first placed. On its way up the leg the roller was also made to pass, by several turns in the form of the figure 8, around the ruptured part. After the lapse of several weeks the bandages were removed, and the patient allowed very cautiously to use passive motion. Monro primus, who ruptured his own tendo Achillis, employed a more complicated apparatus, consisting of a sock or slipper, with a strap attached to its heel, to be fastened upon the leg to keep it steady. The limb was surrounded by flannels, and constantly fumigated with benzoin. Five months elapsed before he could use the limb freely. John Hunter met with a similar accident; and I have known our city practitioners to lacerate the fibres of their gastrocnemii—owing, no doubt, in part, to their riding so constantly, and unnecessarily, in carriages, so that when suddenly called out and obliged to stir their stumps vigorously, by walking an unwonted distance, their unpractised muscles are easily torn. Tendons, like other fibrous textures, when torn, are repaired slowly, and through the medium of a new-formed substance approaching to cellular tissue. In 1827, Dr. Richard L. Fearn,* of Alabama, published an inaugural essay in our University, detailing the results of interesting experiments on tendons. His statements have since been confirmed by other experimenters.

* See Philadelphia Journal of Medical Sciences, for 1827.

SECTION II.

CONTRACTED TENDONS.

THE ham-string tendons in one or both limbs, from rheumatism, burns, inflammation about the knee, diseases and injuries of the leg, and many other causes, are often so contracted, as to lame the patient, oblige him to use crutches, or confine him to bed. From similar causes, the foot may be unnaturally extended, or bent, and great distortion thereby ensue. The same may be said of the elbow and wrist joints. The amount of inconvenience and injury, however, in such cases, is comparatively inconsiderable, inasmuch as these joints, when flexed, are still very useful to the patient; but on the contrary, if rigidly extended, would prove almost as inconvenient as a flexed leg.

But contraction of the fingers and toes, with corresponding deformity of the hand and foot, is much more common than any similar affection in other parts of the body. Sailors and riggers, from handling ropes, and sustaining the body by the hands, or from pressure on the soles of the feet, and toes, whilst balancing themselves aloft; smiths and other workmen, accustomed to hold rough, hard, or hot bodies, are peculiarly liable to have the aponeuroses and tendons contracted, and the skin covering them condensed and indurated in greater or less degree. Ship's companies, during long voyages, and where the weather for weeks, or months, has been tempestuous, and each man obliged to do double duty, may all suffer simultaneously.

Surgeons had long been accustomed to treat such affections, but it remained for the celebrated Dupuytren to explain the true nature of them. He selected a deformed hand, had a drawing made of it, dissected off the integuments from the palm and the internal surface of the fingers. Still the deformity remained. He then laid bare the palmar fascia, found it tense, shortened and thickened, bands or cords going off from its lower part to the sides of the affected fingers, which, upon being straightened, put the fascia upon the stretch. Upon dividing these prolongations, or bands, running to the fingers, the deformity instantly disappeared—showing, evidently, that it depended upon inor-

dinate tenseness of the palmar aponeurosis. Similar views were entertained by the late Mr. Henry Cline.

The appearances presented by this disease, when the hand is the seat of it, are pretty uniform. The ring-finger is the one most frequently affected, the contraction first manifesting itself in the carpal phalanx. The adjoining fingers, and their corresponding carpal phalanges, are next affected, and subsequently the whole range. Folds are next perceived in the skin, the concavities of which look towards the fingers and the convexities towards the wrist. These gradually become thicker and thicker, and seem to keep pace, in their enlargement, with the contraction of the ring-finger. Cords at last seem to extend from one part of the palm to the other, and thence to the different fingers, most of which are, eventually, bent like the talons of a bird, preventing the patient from grasping bodies of any size, without severe pain, and rendering the fingers incapable of extension, even when heavy weights are appended to them, or inordinate force applied. Similar affections of the aponeurosis and tendons of the foot, may give rise to deformities resembling some of the varieties of club-foot.

TREATMENT OF CONTRACTED TENDONS.

Much more may be done by appropriate machinery, or well contrived apparatus, in cases of contracted tendons than is commonly imagined. Few physicians or surgeons, however, have natural ingenuity enough, or sufficient leisure, occupied as they are, with other weighty and diversified professional avocations, to devote sufficient time to the subject to ensure success. Hence such affections are too often intrusted to the instrument-maker or mechanic alone, who, from want of anatomical and pathological knowledge, is frequently as ignorant and inefficient as his own machine. It is fortunate, therefore, that such things are now beginning to be understood, and that surgeons have been found willing to descend from their dignified and high positions, and take up matters, formerly considered unworthy their attention. In all parts of Europe such scientific men have recently made their appearance; and Americans, of similar stamp are beginning to show themselves in the same field, and in our large cities, at least, meet with encouragement. In

Philadelphia especially, Dr. Heber Chase, so well known for his efforts for the last few years to improve the form of trusses, and to effect, as far as possible, the radical cure of hernia, has recently devoted additional attention to the invention of apparatus well calculated to remove many cases of deformity previously considered incurable, and with a success,—for which, from personal knowledge, I can vouch,—by no means inconsiderable. It would be impossible for me, in a work of this description, to enter into details respecting the various forms of apparatus employed by him for different varieties of distortions. I shall, therefore, merely refer to his papers on the subject in the *American Journal of Medical Sciences* and other periodicals of the day—barely adding, that from personal inspection of many of his cases, I have reason to believe that he can accomplish all he promises.

When mechanical contrivances fail to overcome the difficulties the surgeon has to contend against in contracted tendons, an operation may be resorted to—division of these tendons. In former times a good deal was done in this way. Whilst a student, I was requested by a family to examine the corpse of a man for whom a coffin could not be made, owing to his hamstrings being so contracted from long-standing ulcers of the leg, as to cause the legs to stand off at right angles from the thighs. I took a sharp penknife and divided the cords, and by a very slight effort restored the limbs to their natural position. This case made a strong impression upon me, and caused me afterwards to apply the same practice to the living body, and in several instances with not less striking effect. Recently the same operation has been making a noise in London, and Mr. Benjamin Philips is considered, I believe, entitled to the credit of originating it! If investigated, I dare say it would turn out to belong to neither of us, but to some honest, old-fashioned surgeon, whose exploits in this way have been buried for ages in some musty folio, or thick, fat, ill-shaped quarto. But be this as it may, the operation will prove not the less useful, and may be had recourse to upon various occasions, and in various situations, after attempts by machinery have failed, or to facilitate such attempts by saving time, or the patient, long-continued pressure or extension. It must be understood, however, that after such operations have been performed a cure is seldom effected, unless followed up, for weeks, in some instances, by well

regulated mechanical means. Latterly, Guerin, the celebrated editor of the *Gazette Medicale*, has applied the principle of division of tendons to removal of lateral curvatures of the spine, and a few cases, both in private practice and at his Orthopedic Institution, near the Bois Boulogne, attest the success which has crowned his efforts—conjoined, as they are, with pure science and consummate mechanical skill.

For the relief of contracted fingers, arising from shortening and condensation of the palmar aponeurosis, Dupuytren makes a transverse incision about ten lines in length over the metacarpo-phalangeal joint of the ring-finger, through the integuments and palmar fascia, dividing, at the same time, any prolongations that may extend to the fingers. By pursuing this course, he has met with almost invariable success, where other surgeons, who have confined their efforts to division of the tendons, or extirpation of the folds of skin, have as uniformly failed. For the cure of contracted tendons in the foot, the same plan must be pursued. When the toes overlap or project unnaturally from contraction or extension of tendons, from wearing tight shoes or boots, or from natural tendency to such complaints, the plan—originally suggested and executed by Boyer—division of the tendons by a narrow knife or couching needle, must be pursued, instead of amputating these members. After all these operations, well adapted splints and bandages must be applied, and worn until the deformity is removed; and it should never be forgotten, that upon these, more than the operation, the cure is dependent.



SECTION III.

CLUB-FOOT.*

The term club-foot is intended to apply to certain deformities of the foot, met with at various ages; and frequently very dis-

* This section is by Charles Bell Gibson, M. D., of Baltimore.

tinct in themselves. It is either congenital, or accidental. Writers have long attempted to account for its appearance in the congenital form, but so far, not satisfactorily. A bad position of the feet, in utero, seems to be the most plausible solution of the question. The accidental form of club-foot, occurs from various causes—fractures, luxations, sprains, ulcers and partial paralysis.

VARIETIES.

Writers have, for the most part, admitted three varieties of club-foot, although we may perhaps with propriety, question the correctness of the terms employed to designate them.

The first variety, *pes equinus*, from its supposed resemblance to the foot of a horse, is that in which the patient can only walk or stand upon the toes, or metatarso-phalangeal articulation. The second variety, *varus*, in which the patient rests on the outside, or the outer portion of the dorsum of the foot. The third variety, *valgus*, in which the inside of the foot is used.

To these, some authors have added a fourth and fifth. The fourth variety, is that in which the forepart of the foot being thrown under the axis of the leg, the toes and a part of the metatarsal bones turn under the heel, in such a manner, that the dorsal face of the cuboid and cuneiform bones serves as a point of support to the patient. This variety is called *phalangeal*. The fifth is that in which the dorsum of the foot is applied against the anterior face of the leg, internally and externally, the heel being directed downwards. This is called *talus*.

Club-foot, as before remarked, may be congenital or acquired. The latter may appear at any period of life. The most common cases, are, probably, those presenting a combination of *varus* and *pes equinus*.

Cases of *valgus* are rare, and those constituting the fourth and fifth varieties very uncommon.

OF PES EQUINUS.

Pes equinus exists in different degrees, from the simple elevation of the heel, to the entire extension of the foot. There may be various shades of deformity between these two points. The

subject of *pes equinus* usually rests upon the inferior face of the metatarso-phalangeal articulations and the toes, but these seldom receive the whole weight of the body in a uniform manner; for the deviation is frequently a little complicated with inversion, or eversion; if with inversion, the resting point will be furnished principally by the last three metatarso-phalangeal articulations, and the corresponding toes: if, on the contrary, it be complicated with eversion, the first two toes and their articulations, with the metatarsus, will bear the weight of the body.

These secondary deviations, inwards or outwards, may depend upon the laxity of the internal or external ligaments of the tibio-tarsal articulation, or upon a deficiency of antagonist power between the muscles of the inside and the outside of the leg.

The elevation of the heel, in *pes equinus*, is always in proportion to the shortening of the muscles of the calf. The deformity is very slight, when the heel is raised but an inch or two from the ground; and if at the same time the gait is slow, and the shoe well made, it is scarcely observable. When, on the contrary, the muscles of the calf are much shortened, the heel is so much raised, that the forepart of the foot occupies a point posterior to the axis of the leg, and the deformity is so great that it cannot be concealed; the toes and metatarso-phalangeal articulations are separated so as to increase the base of support a third or a fourth. The sole of the foot becomes extremely concave.

In old subjects there is often more or less flexion of the leg on the thigh: this flexion is owing to the shortening of the biceps, semi-tendinosus and semi-membranosus, which is the natural consequence of the increased length given to the limb, by the great extension of the foot. In order to walk, the patient carries the knee forcibly forward, and seems to conceal the leg under him. When congenital, *pes equinus* is not commonly a great deformity. The greatest degree of distortion is observed in accidental or acquired cases, and particularly after paralysis. Then, in fact, the general weakness of the limb permits the strongest muscles, which are also the most disposed to contract, to draw the foot towards them. These muscles being always those of the posterior part of the leg, it results that the heel is more or less drawn up. Finally, the weight of the body assisting the action of the muscles on the inner side of the leg, a complication of the deformity occurs called *equin varus*, which is, as has been before observed, the most frequent form of club-foot.

If, instead of the tibial muscles, the peroneal should be contracted, it is evident that an inversion of the foot must take place, and the case would then be equin valgus and not equin varus; but this, for the reason already given,—the predominance of the inner over the outer muscles,—rarely occurs.

In pes equinus the tibio-fibular cavity ceases to cover entirely the articular face of the astragalus. If the case be a slight one, this face is covered by one-half or two-thirds of the cavity; if the deformity is very great, the cavity rests only on the posterior surface of the astragalus, the rest of its surface being applied to the upper and posterior face of the os calcis.

According to the degree of deformity, the seven bones of the tarsus are more or less separated from each other at their upper surfaces, and this separation determines the amount of convexity of the dorsum, and the corresponding concavity of the sole. The tarso-metatarsal articulations are separated in the same way. The deformity in this variety seems to be caused by the pressure of the tibio-fibular cavity on the posterior part of the astragalus, which it forces forward, the leg taking a twist inwards or outwards, according as the foot is directed inwards or outwards. The articular face of the astragalus is often made to project above the upper surface of the scaphoid. The bones of the second row of the tarsus are likewise changed in their relations; their posterior face becomes superior, and their superior face becomes anterior. To the greater development of the dorsal face of the bones of the tarsus is almost always joined a twist of these bones on their lesser axis, either inwards or outwards. In consequence of this change, the bones of the metatarsus must also be changed in their direction and relations. In fact, the last two metatarsal bones and the toes with which they articulate are often on the same line, and appear as long as the first three, on account of the prolongation forwards of the cuboid. So that, as has been remarked, the patient affected with pes equinus is supported by the inferior face of the metatarso-phalangeal articulations and by the toes.

These articulations, loaded with an enormous weight, separate from each other, and increase very much in one volume, on account of the irritation to which they are subject in standing and walking. When the deformity is very great, the first phalanges of the toes seem to articulate with the superior part of the anterior extremities of the metatarsal bones, so that

when the patient puts the foot to the ground, the metatarsus and the toes describe more or less of a right angle. In this variety of club-foot, the ligaments of the upper surface of the foot are elongated and relaxed, and those of the lower or plantar surface are shortened, and made tense: if, at the same time, the foot is turned inwards, the ligaments are contracted towards this side, and relaxed on the other, and *vice versa*. The muscles of the whole of the deformed limb, and particularly those of the leg, are diminished; this is also the case with the bones, vessels, and nerves, and is in proportion to the age and degree of the deformity. The fleshy part of the muscles of the calf, much reduced in size, seems displaced and mounted upon the top of the leg near the knee. The muscles of the anterior part of the leg, and those of the superior part of the foot, are elongated and relaxed, whilst, at the posterior part, we observe the same contraction as at the plantar surface. ●

The centre of gravity, when the patient is standing upon the deformed foot, answers, ordinarily, to the anterior third of the foot towards the metatarso-phalangeal articulations, whilst in the sound state it answers to the posterior third. Progression is excessively interfered with, and the patient walks as if the foot were ankylosed with the leg. The deformed foot is almost always put before the other.

OF VARUS.

Varus is that variety of club-foot most frequently met with in new-born children. As has already been stated, it is rarely met with in its simple state, being almost always more or less complicated with pes equinus. Like pes equinus, it appears under an infinite variety of shades, from the slight inclination inwards, to the complete turn of the foot on itself. However trifling this deformity may appear before the infant is able to walk, the first attempts at progression very soon develop serious difficulties. Then the point of the foot is directed downwards and inwards, while the twist of the os calcis carries the heel upwards and inwards. The gastrocnemius and soleus muscles, the plantars, the tibials, the long flexor of the toes, and the flexor of the great toe, become hard, resist pressure, and finally appear contracted. The peronei muscles, on the contrary, relax and

become weak in proportion to the unnatural tension of those just named; they are incapable of opposing their more powerful antagonists. In consequence of this want of antagonist power, the points of insertion of the muscles are displaced: those of the anterior and external muscles recede from each other, those of the posterior and internal approach each other. The anterior tibial and the muscles forming the tendo Achillis are most changed, and this change is in more direct proportion with the general progress of the deformity than that of any other muscles.

The extensor proprius muscle of the great toe almost always undergoes the same change, and often even to the extent of throwing the toe half over upon the first metatarsal bone.

The ligaments, like the muscles, are firm and contracted on the sole of the foot and on its inner border, but loose and yielding on the dorsal surface and on the outer border. This general defect in equilibrium tends considerably to increase the deformity, particularly if patients continue to walk as they increase in age. In proportion as the affection becomes more grave, the ligaments that unite the leg with the foot, and the tarsal bones between them enter into a condition of action more and more unequal. Those which go from the external malleolus to the foot are lengthened, and fall into a state of semi-atrophy, whilst the reverse is the case with those going to the internal malleolus.

All the bones of the foot suffer a marked displacement,—a sort of twisting on their lesser axes. This twist commences with the os calcis, the cuboid, and the scaphoid; the cuneiform bones are then involved, and finally the metatarsal bones and the phalanges.

The os calcis inclining outwards, presents its posterior tuberosity inwards and upwards, and its anterior tuberosity outwards and downwards. Its anterior tuberosity is in part abandoned by the cuboid on account of the torsion of the latter on its lesser axis. Between these two bones an unnatural depression exists, which the lengthened ligaments partly cover, and it is this mutual separation of the cuboid and anterior tuberosity of the os calcis that produces the convexity of the outer border of the foot. The scaphoid bone receives but the inferior and internal part of the articular head of the astragalus, being turned from without inwards in such a manner that its internal protuberance appears

situated immediately below the natural malleolus, and its external protuberance directed downwards towards the sole of the foot. It is to this displacement of the scaphoid, and to its twist, that we attribute the angle observed at the inner border of the foot near the internal malleolus, and the same displacement causes the projection of the scaphoid articular face of the astragalus towards the dorsal surface of the foot. It is easily seen that the great changes of relation between the bones just named, must carry with them similar derangements of the cuneiform bones of the metatarsus and phalanges.

In general, as has been remarked by Scarpa, the astragalus suffers the least displacement in varus of infants, particularly if they have never walked, or if the foot has been confined in a suitable instrument: but with adults, or children in whom the foot has not been confined, we sometimes see the astragalus pushed forwards from its articulation with the tibia, and a little outwards from the os calcis, thus enabling its tibial articular face to be easily felt under the skin in advance of the external malleolus. In this state of things, that part of the os calcis situated between the tendo Achillis and the astragalus, and more or less of the internal face of the same bone, are received into the cavity of the tibia intended for the astragalus. From this strange arrangement result the flattening and shortening of the heel.

Other cases of varus have been observed in which the muscles of the calf of the leg were not shortened, and in which, although the foot was strongly turned inwards, the patient kept himself upright and walked on the heel, which, by the way, was much enlarged. In cases of this kind the os calcis is very little twisted: the principal cause of the deformity is in the sinking of the internal border of the tibial articular face of the astragalus; in the contraction of the tibial muscles, anterior and posterior; of the short flexor of the toes, and of the adductor muscle of the great toe. The scaphoid and cuboid bones are directed inwards without being strongly turned on their lesser axis; the three cuneiform follow the movements of the scaphoid and cuboid, and are like them directed inwards. The metatarsals and phalanges are also changed in their relations, in consequence of the displacement of the second row of tarsal bones. The plantar surface of the foot is very concave, as it would necessarily be from the tension and shortening of the muscles of this part of the plantar aponeurosis.

Notwithstanding the various derangements to which the feet of patients affected with varus are subject, it is still certain that their texture and configuration are not always sensibly altered, especially in young subjects. Owing to the repugnance which patients naturally have to the exercise of the affected limb, long and frequent intermissions occur in the reciprocal action of the bones on each other, and luxation and deformity are thereby delayed and interrupted. Where the deformity is not very great, patients support themselves tolerably well on a portion of the external border of the plantar surface, but when the torsion becomes extreme, they no longer find a support in the plantar surface; they seek it in the middle of the outer border, or in the external third or half of the dorsal face, all the forepart of the foot being turned completely inwards.

With other patients, the point of support is merely a large callosity covering the anterior tuberosity of the os calcis, the dorsal face of the cuboid and the interval between the cuboid and the os calcis. This callosity has the appearance of a true heel.

Other patients, again, have their support in the base of the posterior tuberosity of the fifth metatarsal bone.

The articular head of the astragalus abandoned by the scaphoid, the anterior tuberosity of the os calcis, and the cuboid bone, furnish to certain others a sort of tripod, for support, sufficiently large and solid.

In all cases of varus, the external malleolus is placed lower and more behind than in the natural state; it almost touches the ground, whilst the internal malleolus, pushed more forwards, is no longer visible. The point of the foot is almost always carried upwards, and very much inwards: sometimes the great toe seems almost to touch the leg. The dorsal face is extremely convex, and the sole proportionally concave and deeply furrowed. The heel is so raised and directed inwards, that in many subjects it appears not to exist at all. The skin covering the dorsum of the foot, and its external margin, is studded with callosities, which impart a hideous aspect to the foot, especially on the elevations made by the bones. The limb is, in general, less developed than in the sound state; the muscles are shrunk, and yellow; the tendons longer, more delicate, and surrounded by a greasy cellular tissue. The tendo Achillis has, in some cases, half the length of the muscles from which it comes: its size diminishes as the deformity increases, probably

on account of the inertia which pervades the whole muscular apparatus of the limb.

With the exception of the anterior tibial muscle, which is always the last to lose its size and colour, and some occasional nerves which have preserved themselves amid such general decay, all the constituent parts of the deformed limb, muscles, tendons, ligaments, vessels, nerves, even to the bones themselves, fall, sooner or later, into a puny and miserable condition; which may, perhaps, be in a great degree attributed to the inefficient means of exercise left by the deformity to its victim. In double varus, especially, the effort to walk is extremely painful: the patient is obliged to raise each foot as if it were ankylosed, and to pass one over the other. The centre of gravity varies according to the degree of deformity; always, however, being posterior to the external malleolus, making each step vacillating and insecure, and exposing the patient to continual falls.

OF VALGUS.

The third variety of club-foot, called by the ancients valgus, is much less common than the preceding varieties, especially in the congenital state. When congenital, the form in which it is ordinarily seen is the following. The foot is thrown strongly outwards, touches the ground only by the anterior half of its internal border, and rests principally on the first metatarsal bone and the great toe. There is always a separation between the surfaces of the first metatarsal and of the internal cuneiform bone. Sometimes the scaphoid and internal cuneiform, and the scaphoid and head of the astragalus articulating with it, undergo a similar derangement in their relations to each other. It is not impossible to meet with these three different irregularities in the same foot. The outer edge of the tibial articular surface of the astragalus, and the corresponding side of the same bone, is all that is received into the tibio-fibular articular cavity.

The posterior tuberosity of the os calcis is directed outwards, and its anterior tuberosity inwards and towards the sole of the foot. The tendo Achillis is often, and the peronei muscles are always shortened. The inner border of the foot is convex, and seems to start from the internal malleolus, which has become much more prominent than usual; the outer border of the foot

on the contrary, is concave, and the centre of the concavity answers to the calcaneo-cuboid articulation. The sole of the foot is often apparently hollowed out, and numerous deep wrinkles cover it in all directions.

We sometimes meet with cases of valgus, in which the foot is not deformed, but merely directed outwards, without material shortening of the muscles of the calf. The peronei muscles alone, in these cases, are in fault; for not having the necessary length, they communicate movements of rotation and torsion to the articular head of the astragalus in the tibio-fibular cavity.

In this variety of club-foot, it is evident that the ligaments corresponding with the inner border of the foot will be relaxed, and their antagonists made tense.

Consecutive or secondary valgus is much more common than the congenital form of the disease. It is occasionally met with in one foot, whilst varus exists in the other. In very many cases it commences with slight pes equinus. Patients in walking and leaning upon the inner border rather than on the outer border of the foot, put the tibial muscles in a forced state of extension, and the peronei muscles in a corresponding state of contraction:—the result of this double action is the rapid production of valgus.

OF PHALANGEAL CLUB-FOOT.

The fourth or phalangeal variety of club-foot is extremely rare—but, like the others, has its different degrees of deformity. In its first degree, the foot is rather doubled under the sole than broken in two. The point of support is the dorsal face of the toes and the metatarso-phalangeal articulations; the metatarsal bones are directed obliquely, from above downwards, and from before backwards; the heel is situated very high, and transverse deep wrinkles cover the sole of the foot. We meet with this form of the fourth variety only in children who have walked but little; as the patient gets older, his body becoming heavier, the flexion of the foot backwards increases, so as to produce a second and a third degree.

In the second degree the deviation of the foot commences between the metatarsal bones and the second row of tarsal

bones; the metatarsals, bent at a right angle under the tarsus, serve as the point of support; the toes are sometimes gathered up under the heel. This semi-luxation of the metatarsal bones below and behind the second row of tarsal bones, forces the anterior face of the cuneiform and cuboid bones to become inferior, and often obliges them to assist the dorsal face of the metatarsal bones in forming a point of support for the patient.

In the third degree, we find the foot broken, as it were, between the first and second row of tarsal bones, with a sort of luxation of the scaphoid and cuboid below and behind the scaphoid articular head of the astragalus and the anterior tuberosity of the os calcis. The point of support is the dorsal face of the second row of tarsal bones, on the anterior eminences of the astragalus and os calcis—now become inferior. The metatarsal bones and the toes, relieved from all contact with the ground, are folded under the heel, and pass considerably beyond it.

Whether this variety of club-foot be congenital or accidental, it is owing to the same causes,—to the shortening of the muscles of the calf, of the long and short flexors, of the toes, of the plantar aponeurosis, and of almost all the ligaments of the sole of the foot.

OF TALUS.

The fifth variety of club-foot, talus, is still more rarely met with than the last. In it the foot presents its dorsal surface against the anterior region,—internal or external,—of the leg. The toes are directed upwards, the heel downwards, the sole forwards, and inwards or outwards. The extensor muscles of the toes, the tibialis anticus, and the peronei muscles are shortened. When we attempt to remove the foot from the leg, to give it a more natural position, a powerful resistance is experienced. If the dorsum of the foot answers to the anterior and internal face of the leg, the extensors, the tibials are more contracted than the peronei muscles; the reverse is the case if the back of the foot is against the external face of the leg. In general, the foot is very little deformed in this variety. The tibio-fibular cavity contains but the anterior edge of the astragalus; all the rest of the superior face of this bone is carried to the back of the leg at the anterior part of the tendo Achillis.

The os calcis, situated vertically, touches the ground by its posterior tuberosity.

TREATMENT OF CLUB-FOOT.

With regard to the treatment of club-foot, at the present day, there seems to be considerable difference of opinion among surgeons. Within the last few years, it has become the fashion to divide some one or more of the tendons belonging to the foot, most generally the tendo Achillis, on account of the influence their contraction is thought to exert upon the various deformities: accordingly we find, perhaps, the majority of surgeons in favour of this operation; and there is no question, that extreme cases of the disease, have been improved by it, and the subsequent employment of apparatus. But it is questionable, how much of the benefit is attributable to the section of the tendon, and how much to the power of the apparatus. I am inclined to believe, that in very many cases, the section is unnecessary, if not absolutely injurious, and that the employment of apparatus alone, is a competent means of cure. We find in the works of Hippocrates, an account of club-foot, with also very simple and excellent precepts for its treatment,—by means of bandages, frictions, and a shoe. His principle was to proceed with gentleness, endeavouring to restore the foot to its natural conformation, by careful and long-continued pressure in the proper direction. His successors paid very little attention to the subject; and, until the appearance of Scarpa's memoir, in 1803, there existed no accurate views of the pathology of these deformities, nor any well contrived form of apparatus for their relief. It is true every country was overrun with ignorant pretenders, and quacks, who had each their own peculiar mode of treatment, which was also kept secret, for reasons easily imagined. Among the more respectable of those who treated club-foot, and kept their apparatus secret, were Jackson, in England, and Tiphaine and Verdier, in France. We yet remain ignorant of the means they employed,—for they were buried with them. Before the appearance of Scarpa's memoir and apparatus, a Swiss physician, Venel, invented an instrument, very simple and ingenious, which performed radical cures of very many children, affected with varus and valgus. He also founded an establishment, where his treatment had the same success, and

brought patients from all parts of Europe. Scarpa speaks slightly of Venel's instrument, but his impressions were drawn from an account of it given by Bruckner, which, it would seem, was very deficient and incorrect. Venel's pupil, D'Yvernois, in 1817, published a correct account of this instrument, in his essay on club-foot,—having also, three years previously, submitted it to the examination of a committee of the Société du Ceicle Medicale. This explanation of Venel's instrument by D'Yvernois placed it very much in advance of any other then in use, and its success in the performance of striking cures gained it considerable reputation. Bruckner and Boyer also invented and made public, instruments, which they conceived to possess improvements upon those then in use. It would be an endless task to describe these various contrivances after the manner of their inventors, and it is even doubtful whether their description would be useful; for the best of them are complicated in comparison with the forms of apparatus in use at the present day. Scarpa's apparatus is so complicated, as to prevent its application very often, even by the most skilful hands. All that is retained of it, in the instruments now used, is the principle upon which it operates. The mechanical means employed by Dr. Chase, of Philadelphia, in the treatment of club-foot, having recently attracted some attention, I here insert a short account of them, drawn up by that gentleman, and obligingly furnished me for the purpose.

In deformities of the feet, whether there exists an *inversion* or *eversion*, the same principles will apply in their restoration. In *inversion*, whether the foot has advanced to the first, second, or third degree of *varus*, (so called by writers,) the first step towards the restoration consists in bringing the distorted foot into the same axis with the leg. This I accomplished by aid of an instrument which consists of two parts,—a brass splint and steel plate,—which are connected by a soft iron neck, that can be bent by applying considerable force, but will not yield to the power necessary to act upon the foot. The splint is concave, extending from the knee to the malleolus, and when applied, embraces one-third the circumference of the leg. This splint is secured to the leg by straps or rollers. The plate for an adult is one inch in width, two lines in thickness, and extends a distance equal to the interval between the ankle and ends of the toes. In this plate are three fenestræ. When the splint is se-

cured to the leg, to evert the foot, straps are passed through the fenestræ and thrown around the foot, which is brought as near the plate as possible, without producing pain. These straps are to be drawn from day to day as the foot yields to the action of the instrument. This instrument must be continued in use until the foot is not only brought into the same axis with the leg, but until the toes become partially everted, and all disposition of the foot to return to its deformed state has ceased. In cases of *eversion*, the same instrument must be applied to the inner side of the leg, secured by straps or rollers, as in inversion, and the foot brought inwards by the same mechanical action. The foot being now extended on the leg, the next indication to be fulfilled is to effect the proper flexion in the ankle joint. This I have accomplished by the following instrument.

“It consists of a plate of brass moulded to fit accurately to the back and sides of the leg, which should extend from just below the knee to the ankle: a second piece of brass is formed to act as a sandal or shoe, equal in length, and a little wider than the foot. These are so attached as to admit of flexion and extension. The leg is secured to the superior part of the instrument, and the foot to the shoe by means of straps and buckles, while flexion is made by two straps extending from that part of the shoe, corresponding with the toes of the patient, to the anterior superior part of the instrument at the knee.

“In that variety of deformity where the patient walks upon the toes, (*pes equinus*,) the instrument for flexion of the foot alone, is required, unless the foot be partially inverted or everted. Under these circumstances, the instrument for inverted or everted club-foot must first be employed to restore the foot, as directed in the treatment of those cases, after which flexion must follow.

“When the patient walks on the heel, (*calcanean club-foot*,) and but little force is required to bring the toes to a level with the heel, a shoe so constructed as will throw the weight of the body anterior to the perpendicular line of action of the leg with the foot is all that is required; but when considerable force is necessary to bring down the toes, the instrument for producing flexion must be employed, with the straps reversed, in order to extend the instrument.”

The treatment of club-foot, by division of one or more of the

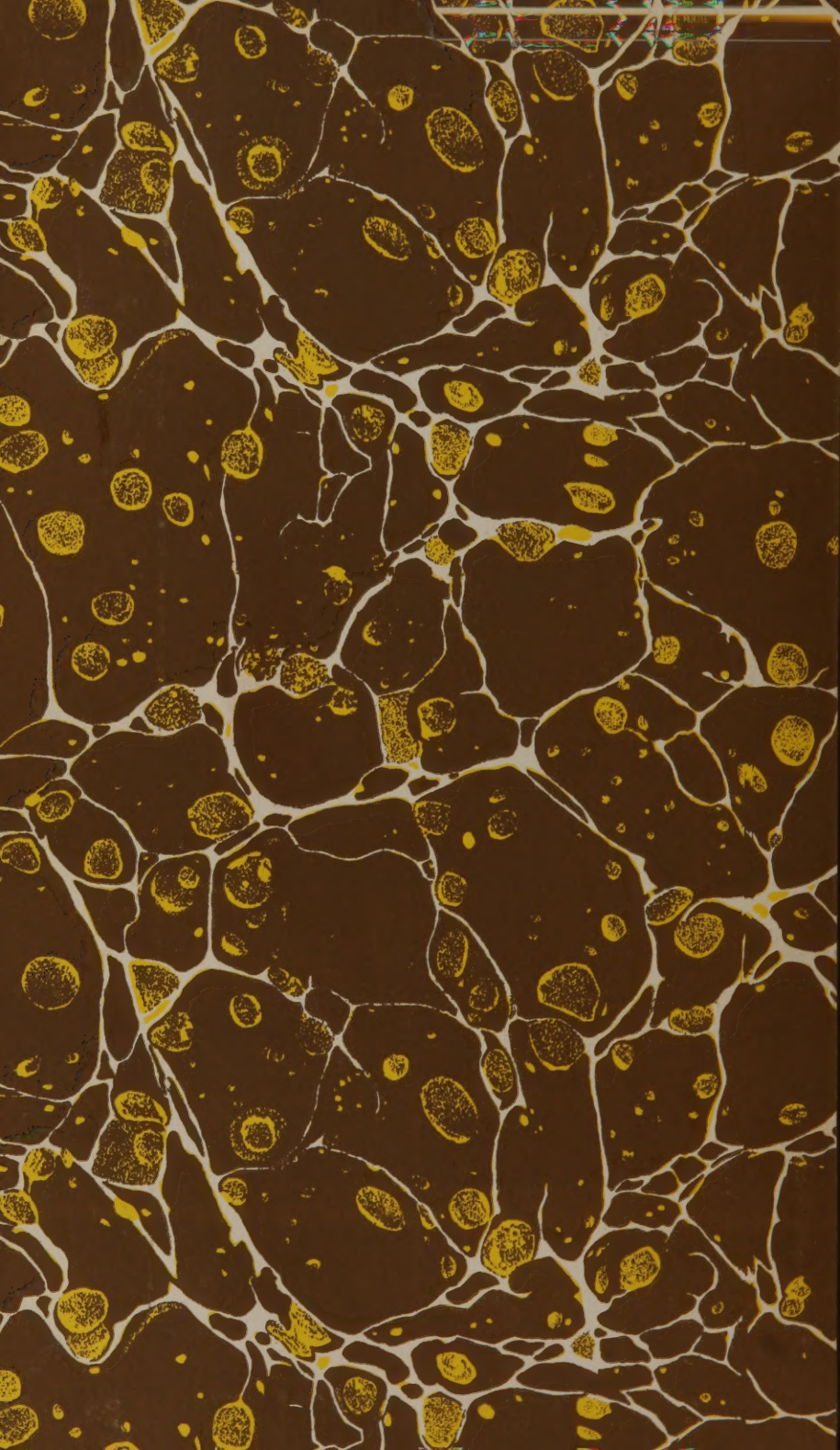
tendons, supposed to be instrumental in the production of the deformity, is thought to have originated with Thilenius, who performed the operation, successfully, in 1784; though it is said to have been executed, still earlier, by Lorenz, in 1782. He was followed by Michaelis, in 1809, and by Sartorius, in 1812, who, like him, divided the tendo Achillis. Delpech, in 1816, was the next to perform the operation, but he was not as successful as his predecessors, and although convinced of its usefulness, never undertook it a second time.

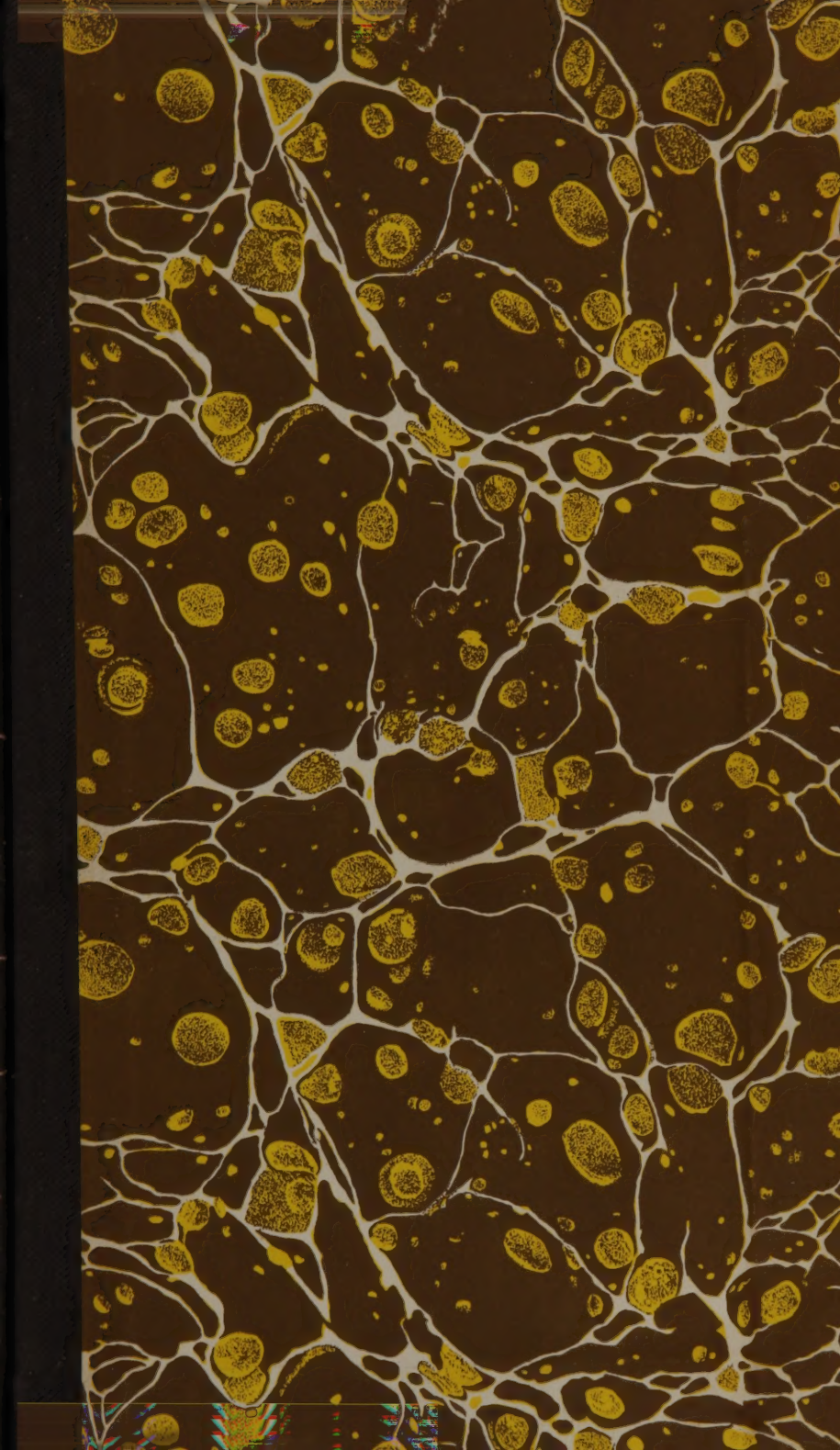
In 1831, the celebrated Stromeyer performed it, and met with complete success. From that period to the present day, the operation has become more and more established, and is now looked upon as an affair of every-day occurrence. In Europe, Dieffenbach, Duval, Bouvier, Roux, Liston, Whipple and Keate, are among the most noted surgeons who have practised the operation; and in our own country it has been performed very often by physicians as well as surgeons, sometimes with benefit, but, at other times, with most injurious consequences. The operation itself is extremely simple, when the tendo Achillis is to be divided, and not much less so when the tibialis-anticus, or the peronei muscles require it.

Certain surgeons prefer to bring down the heel, in the case of division of the tendo Achillis, at once, and retain it in that position, until a union between the divided ends has taken place. Others, again, allow the heel to retain its original position, and endeavour to place the ends of the tendon as nearly as possible in contact, relying upon the extensibility of the connecting medium to bring down the heel, when desired. The treatment of club-foot, after the division of the tendon, is very much the same as that used without such operation, and is simple or complicated, according to the skill or want of skill of the surgeon, for no one individual uses exactly the same form of apparatus.

The mode of operation for the division of the tendo Achillis, varies almost as much as the form of apparatus, but among the most simple, would appear to be the following. The surgeon taking a very narrow bistoury, and having an assistant to flex the foot as much as possible, introduces it—an inch or two above the insertion of the tendon, into the os calcis,—directly at the anterior face of the tendon. The cutting edge of the instrument is then turned against the tendon, and a gentle sawing

motion communicated. The tendon is almost immediately divided, a sensible cracking of its fibres is heard, and the superior portion retires. This operation generally lasts but a few seconds, and is followed by the loss of but a drop or two of blood. When any of the other tendons require cutting, such as the anterior tibial in varus, or the peroneal in valgus, the same plan of operation may be pursued.





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